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SCIENCE

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Friday, January 4, 1946

Editorial

GREETINGS FOR THE NEW YEAR from the new staff of *Science*! This, our first issue, comes to you as *Science* enters upon its sixty-fourth consecutive year. For 1946 we are therefore bringing you not a new magazine, but a very old one dedicated to providing you with a weekly cross-section of science in the making.

You will notice that the familiar advertisement on the front cover has disappeared. Cover space will be used henceforth to direct your attention to the more significant and newsworthy features of each issue. This was a step taken by the Editorial Staff and the *Science* Policy Committee only after weighing the consequences as realistically as they could be determined. Four advertisers have held the front cover position for four decades. Their support, week in and week out, has been no small factor in keeping *Science* solvent. Their continuation in other, less favored positions in this and later issues speaks for their devotion to our common cause.

With this issue *Science* also becomes a covered journal—the covers are of somewhat heavier, tougher stock than the text pages—an obvious advantage in the preservation of back numbers. Also, for convenience in handling and in filing, the magazine is trimmed. For the sake of the record an entire page will be regularly devoted to an enlarged Table of Contents which will be found each week in a regular position; we think it is space well spent.

The space occupied by this editorial will hereafter be devoted to an article of three or four thousand words in length, treating some significant, newsworthy development in the larger scientific field, or presenting in an understandable vocabulary an issue, a finding, or a summary in some field significant to us all.

Usually, this longer leading article will be followed by a series of four or more shorter contributions which will many times be addressed to a more restricted audience than can be encompassed in the entire membership of the Association. We have chosen to label this section "Technical Papers," rather than "Special Articles," as it has been called in the past.

Most of the special areas of inquiry have somehow managed to support a medium of publication. *Science* sees one of its more important functions, not in competing with these technical publications but in supplementing them and offering a service to those newly opened fields which border on each other and are usually designated by hyphenated titles.

In "Technical Papers" we shall try to discourage a content and a style which appeal only to the specialist. We shall give high preference

to those papers that give evidence of a cooperative attack on some problem common to several specialties.

The overall editorial policy remains the same as it has been in the past—to try to present in as concise a form as is possible outstanding events of significance to all scientists, with an emphasis on those items that are of current interest. *Science* offers a quick mode of announcing scientific discoveries, appearing, as it does, fifty-two times a year. It does not, and cannot, operate with the speed of nonscientific journals, but compared to the usual scientific media which have publication lags of six to eighteen months, it offers unusually prompt service.

Men of science are not always men of letters! In providing for the editorial supervision of *Science*, the Executive Committee of the Association had in mind a distinct service to the officers of the Association who have manuscripts in preparation for delivery to sections and for subsequent publication. Wisely, the Executive Committee refused to bind the Editor's hands, so that *Science* is not *required* to publish all official addresses. The Executive Committee, the *Science Policy Committee*, the Editorial Staff, and the Editorial Advisers hope that every sectional address will be significant enough, broad enough, cogent enough to be printed in these columns. To that end the Editorial Staff offers its service to prospective authors. It hopes that authors will enter into preliminary correspondence and inform the staff of the title, the treatment, and the preliminary content of these papers. Let us help where we can.

Several new features will be introduced during January. One of them begins today—a section called "Letters to the Editor." The letters will usually be short comments on happenings of interest in the world of science, or the presentation of critical comments on some of our more controversial articles. Here we expect to provide an outlet for news, notes, comments, and controversy which do not warrant longer papers but are too important to be completely overlooked. We invite you to make use of this section.

Another editorial division, which will be used as often as the occasion demands, will be called "Science Legislation." Here we will abstract bills pending in the House or the Senate which bear on any phase of science. In this work, as in all other phases of our operations, we keep in close touch with Dr. Howard A. Meyerhoff, Executive Secretary of the Association, whose contacts on Capitol Hill have resulted in positive advantages to the whole of our Nation's scientific activity. Our readers are asked to keep us informed of pertinent local legislation in their areas.

Another development which will be reflected in future issues is an expanded and more comprehensive Book Review Section. We hope to provide numerous short reviews covering a wide variety of subjects. Here the Editorial Staff needs the cooperation of authors, publishers, and reviewers, if this section is to be an effective part of *Science*. A preliminary inquiry to publishers has already brought an encouraging response. From authors and publishers alike we have definite need of concrete suggestions for responsible reviewers of these publications. In time we would like to build a file of persons in all fields who are competent to review technical books and who will write the reviews promptly. The Editorial Staff invites those who would be willing to prepare reviews in specialized

areas to write to the Editor, naming the fields in which they are competent to review new books. This invitation is especially directed to the younger scientific workers. By taking advantage of it, these people can render a distinct service to all scientists who read these columns.

In conducting the Book Review Section we are working in close collaboration with the Editor of *The Scientific Monthly*, to the end that there shall be no duplication of reviews in the future. We intend to continue the tradition that *The Scientific Monthly* will review the more popular books while *Science* will confine its attention to those of a more technical nature.

In addition to reviewing current books, we have laid plans to conduct a "Scientific Book Register," listing by title all significant new books in science as they appear. To this end the cooperation of the technical book section of the Library of Congress has been secured, as well as that of the publishers of scientific books. In the beginning the Register will appear bi-weekly, and since book production is seasonal, it will not be of the same magnitude in each issue.

Another related service will alternate with the "Scientific Book Register." Industry and laboratory supply houses constantly produce catalogues and brochures which come to the Editorial Office in large numbers. Many of these are indispensable to scientific workers in that they often provide a key to some research problem wholly aside from any objective the production of the catalogue might have had in the first place. We will call this section "Catalogue Corner." Later in the year we will sample the membership of the Association regarding its continuance.

Science does not develop wholly independent of the happenings in the world about it. Wholesale starvation brings an interest in nutrition; invasions of tropical beaches bring widespread interest in tropical hazards to the invader—and incidentally to mankind; a new explosive brings an interest in all forms of energy release; a "dust bowl," a dam, a comet, a Parícutin, bring other consequences in matters of reflection, deliberation, restructured values.

To these ends *Science* can contribute. It is our plan to introduce a series of *Special Issues* bearing on topics of signal importance as determined by the events of the day. No small part of these events are the opportunities afforded by the Association to gather at periodic intervals to hold exchanges of opinion and data, to give and to take. One such occasion is on our near horizon—the meeting in St. Louis—and to it we will devote a *special number* in anticipation and a *special number* in retrospect.

The attitude of the *Science* Policy Committee and the Editorial Staff is wholly experimental. We give you now the first issue of a New Year. It is a compromise containing some items that do not wholly please the Editorial Staff. Later issues will incorporate changes as we try first one experimental variable and then another. *Science* is being produced in the interests of the membership of the American Association for the Advancement of Science, its owners. Write to us! Let us know how you react to the changes you observe week by week.

A National Science Foundation and the Scientific Worker¹

R. W. Gerard

University of Chicago

WITH THE ATOMIC BOMB, science came of age in our civilization. It will now have, and must exercise, the right to vote. One would not have chosen as the setting for our coming-out party "the rockets' red glare" and "bombs bursting in air," but such drama—and tragedy—was perhaps essential to stir both scientists and public to a realization of the penetration of science and technology throughout modern society—in peace far more than in war, for creation far more than for destruction.

Scientists have been slow in this country to fill their legitimate place in human affairs. Many men were content to pursue their private quest for knowledge and eschewed any responsibility beyond their towered walls. The historical tradition has lingered on—from the time when science was a dilettante interest of some wealthy individuals able to humor their personal whims or to patronize others who served as court scientists, like court magicians or jesters or musicians.

Only as certain tangible and useful results of these esoteric experiments reappeared time and again did science find its way into the universities and into the lower schools; did society begin to support experiments on a significant scale; did the scientist and technologist receive requests for aid from industry and agriculture and the military. But, in the mind of the expert as well as of the community, he was still doing only his particular job of research or application. He was still, in the telling figure of Carl Minor, "in the kitchen." He was still, as Raymond Swing recently pointed out, conspicuously absent from the invited consultants to the delegations at the San Francisco Conference or from those meeting in London to set up an international education office, "Not a single prophet of the century ahead of us was even asked to advise the men of state." Parenthetically, Compton, Shapley, and other scientists have now gone to London; and on 7 November Archibald MacLeish announced that the United Nations Educational and Cultural Organization has become the United Nations Educational, Scientific, and Cultural Organization.

¹ Contributed to a panel discussion on "Research, Government, and You," sponsored by the American Association for the Advancement of Science and the Chicago branches of leading chemical organizations, 8 November 1945, Chicago, Illinois.

All this was slowly changing for, as the Moe report puts it, "Science cannot live by and unto itself alone." Science was reaching social maturity. Its war contribution, through the Office of Scientific Research and Development and allied organizations, was impressive. Dr. Bush was close to President Roosevelt, and plans for a government research foundation began to incubate. How they would have fared in Congress on their own merit we will never know. As Dr. Bush wrote, "The Government has only begun to utilize science in the nation's welfare. . . . Science has been in the wings. It should be brought to the center of the stage."

Well, the atomic bomb brought it there and spotlighted it, and Congress is at last tumbling over itself with proposals to nourish the roots of discovery, as in the Magnuson and Kilgore bills, and to stifle its flowering, as in the May-Johnson bill. Science is in politics now and is in to stay. There will be changes that scientific workers will like and some that they will not like. I am convinced that the good will far outweigh the bad, but, even if the reverse were true, the road science is taking and is to take has long been inevitable (e.g. *Science*, 1942, 95, 309). Recent events have accelerated movement, not changed direction.

Let me remind you of some of the changes within science. True laissez-faire research is almost unknown even now. Scientific workers are professionals and require some employer to pay for their living and to supply their facilities. In industry it is taken for granted, except in rare cases, that the technologist works on assigned problems. In universities and a few other institutions freedom of research is the slogan. But is it the fact? Research costs ever more money, and few institutions indeed have an adequate and fluid fund to support it. Investigators seek additional aid—from industry, from foundations, from private donors—and deliberately or without awareness they tend to shape their research to tap the available sources. When the Rockefeller Foundation becomes interested in research in psychiatry, so do many investigators; when the National Foundation for Infantile Paralysis has millions to spend, articles on nerve and muscle degeneration multiply; and the Bowman Committee warns, in connection with research grants, that we "need to guard against control of science by

industry as well as against control of science by Government."

Further, with multiplying techniques and pyramiding knowledge, scientists have had to take refuge more and more in collaboration and team research. To ride the flood of literature, to master apparatus and methods based on far-flung branches of science, to turn out experimental findings at the ever-mounting tempo, the investigator needs help desperately. Abstracts, reviews, local bibliographers; secretaries, editorial assistants, draftsmen, photographers; machinists, glass blowers, animal caretakers; technicians and assistants; colleagues and collaborators—all these are needed to keep up with the Joneses in favored institutes. Quite aside from the war situation, what fraction of all our well-trained scientists is even now in a partly subordinated research position, as junior member of a team or lieutenant to a director?

Please do not misunderstand my not feeling too sad about this. I know as well as anyone the absolute indispensability of the imaginative insight and the freedom to exploit it. But I know also the ratio in time and effort between getting an idea and working it out. One first-rate creative scientist can keep dozens or hundreds of good men working at full effectiveness and maximum fertility, and, if human relationships are also fortunate, with complete personal satisfaction as well.

For all the pressure of immediate results, the sacrifice of personal research interests, the coordination from above, most scientists, I believe, were reasonably content in OSRD work, and many even under the additional strictures of work done directly with the armed forces. Science, like society itself, has become too large and too complex to remain completely individualistic.

The problems for the future are to find and to recognize true talent and leadership, to keep open the road to the top for all individuals possessing these qualities regardless of social status, and to maintain in scientists a greater concern for the good of the many than for selfish gain. These problems will become more pressing as more money, more power, and more prestige are attached to the scientific calling.

The present science bills, or any reasonable modification of them, will direct a great stream of financial support into the academic pools. In these bills emphasis is on basic rather than applied research, on aid to universities and like institutions rather than to industry or Government agencies—on recruiting young talent and subsidizing its full education. The amount of money under consideration is some fivefold the total annual expenditures made in the academic research field at the start of the war. Under this pressure many of the traditions and procedures which

clothe the universities will burst their seams. Many unscholarly, aggressive entrepreneurs will be attracted by the odor of gravy.

If, however, the intent of the scientists who planned the National Science Foundation and of the legislators who are creating it is realized in the character of the administrative machinery, organization, and personnel, we may expect the inevitable readjustments to be salutary.² More, and more able, students will be recruited into science; but the cream of talent must not be skimmed from other areas of human enterprise, especially in the social sciences. More, and more desirable, research posts will open up to these students when their training is adequate; but relatively fewer will work on their own and at individual programs. Scientific discoveries will be increased in number and develop more rapidly; but the really great imaginative leaps in understanding will be of hardly greater frequency. The men and institutions and activities associated with research will be in the spotlight and under far greater social pressures and will have to make sacrifices to meet them. Perhaps, even, as Bernal suggested in his *Social function of science*, research teams will come to include publicists, promoters, lawyers, and other nonscientific members.

As science outgrows its cloistered walls and becomes a full-fledged participant in the hurly-burly of society, it must meet both responsibilities and opportunities. Scientists must be trained appropriately. They must learn in college, preferably as a part of a liberal education program, a minimum beyond their professional courses, including sufficient social science to cover the external relationships of science. They, or some of them, must learn the methods and skills of popular adult education. As the Moe Committee wrote, "It will not be sufficient, if science is to remain healthy in root and branch, merely to develop a large number of scientists and to provide them with the support necessary for their investigations. There is also the necessity of creating a better understanding of science in our national life, so that public approval and support for the future development of science will be forthcoming."

Scientific workers will find themselves forming more closely-knit and extensive groups, not primarily devoted to the exchange of technical knowledge. These groups, like the national American Association of Scientific Workers or the local Chicago Technical Societies Council, or, more and more, the American Association for the Advancement of Science itself, will be concerned with the interrelations of sciences,

² This paper was written before the public statements of the Committee supporting the Bush Report. It was not intended as approval of any specific bill before Congress. My own belief is that several improvements are possible in drafting a final bill.

and especially with the external relations of science as a whole.

These groups will in time become action groups, attempting to influence public opinion and Government decisions in order to protect research from debasement and restriction and to extend the beneficial influence of research results and methods. After becoming strong and active, these groups will be in

grave danger of forgetting their social obligations, of existing to serve the personal ends of their members and officers. This tragedy has happened often enough, in business, in labor, in agriculture, and even in the professions. If it should ever become the habit of scientists, I assure you, fellow scientific workers, we will be judged and treated accordingly by the society of which we are a part.

Alliance of Industry and Scientific Research in Great Britain

Basil J. A. Bard, Ph.D., B.Sc., Barrister-at-Law

Head of the Industrial Research Secretariat of the Federation of British Industries

THE LIFE AND WORK of the universities impinge upon the activities of industry in a variety of ways. New industrial products and processes frequently will be found to have germinated in the investigations carried out in the university research laboratories. Industry looks to the universities for provision of graduates for its technical, research, and, in some instances, high administrative positions. There are also indirect consequences of the dissemination of knowledge and culture from the centers of learning. These have their effect upon public and industrial opinion and national policy, which in turn may affect, by legislation or otherwise, industrial practice and progress.

In Britain since the end of the war there has been searching consideration of whether industry has been making its maximum contribution to the well-being of British universities and how it could benefit more fully from their activities. In the ensuing discussion, special attention has been devoted to scientific and industrial research.

There are many schemes now in hand in Britain for the expansion of pure and applied research in industry, cooperative research laboratories, and the universities. At the time of writing, however, many of the scientists, technicians, and research workers who have devoted their whole energies to World War II have not yet returned to their peacetime activities, and these have by no means reached fruition. This is an interim report, therefore, on some of the plans so far announced for a more intimate relationship between British industry and the universities with regard to scientific research. These plans are intended not only to assist in harnessing the work and results of universities to industrial needs without interfering with, or prejudicing in any way, the independence or integrity of the university spirit, but also to develop and maintain closer contacts between research workers in different environments.

The British universities, twelve in number, are renowned for the contribution they have made to the

advancement and dissemination of learning. Few countries offer so rich a variety of facilities for access to the highest forms of education. In the sphere of science British universities have occupied themselves very considerably with investigations of a fundamental kind at the outer boundaries of man's knowledge of nature.

Although, in the long run, social and industrial advance is largely dependent on this extension of knowledge of the material universe, the whole spirit and atmosphere of university research is single-minded concern with the acquisition of knowledge for its own sake. The fundamental research carried out at the universities has fed and inspired the research undertaken in industrial laboratories, which has, in turn, irrigated the fields of industry. For instance, the first successful experiments in splitting the atom were carried out by Lord Rutherford at Manchester University and subsequently at the Cavendish Laboratories in Cambridge before World War I, and the theories then propounded by him on atomic structure have now been confirmed in practice by the atomic bomb.

Despite the fact that the universities are, rather naturally, a little remote from industry, there have grown up in the past a certain number of close contacts of great mutual benefit. For instance, collective research in the British glass industry is carried out in a special department of Sheffield University; at Leeds University a department deals with coal, coke, and gas research and another with textiles; at Birmingham will be found an experimental coal mine and oil-boring equipment. Furthermore, certain of the provincial universities contain technological departments serving the industries of the locality. There are also a number of recognized technical experts on university staffs who act as consultants to industry, and they and their laboratories, by bringing their experience to bear on industrial problems, have been of assistance in their solution.

Accounts now being given of the great scientific achievements of World War II show that a good deal of the fundamental work on which these were based and, during the last three or four years much of the applied work also, has been carried out in the laboratories of the universities. For instance, research on radar was undertaken at Bristol, at Birmingham (where the first magnetron valve was designed), at Cambridge, and at Nottingham Universities.

Recent reports of the Association of Scientific Workers and the Association of University Teachers have attempted to define the proper place of industrial research in the universities. Both organizations agree that departments of applied science should be fostered at the universities, but that in the normal way industrial development work should be carried out elsewhere. They believe that the war, as well as making abundantly clear the close connection between pure and applied research, has revealed the inadequacy of the intercourse between academic scientists and their industrial colleagues. They recommend closer contact and collaboration between industrial, governmental, and university laboratories and, where practicable, interchange of members of research staffs.

The endowments now being offered to universities by industry, in addition to being of great assistance to the work of the universities, contain within themselves an element of enlightened self-interest. One of the most important of these is the offer by the directors of Imperial Chemical Industries of eighty senior fellowships averaging 600 pounds a year each to universities in Britain (twelve each to Oxford, Cambridge, and London; eight each to Glasgow, Edinburgh, Manchester, Birmingham, and Liverpool; and four to Durham), to strengthen scientific research in physics, chemistry, and applied sciences, such as metallurgy and engineering. The administration of the scheme, which will operate for an initial period of seven years, rests wholly with the universities, which will select and appoint the fellows.

Birmingham University, in the center of the non-ferrous metals and light engineering industries, has received an offer from Messrs. Joseph Lucas (motor and electrical equipment engineers) to endow two-year postgraduate courses in production engineering at a cost of 112,000 pounds, and a further 10,000 pounds has been offered to grant bursaries to needy engineering students. The University is considering also the establishment of industrial metallurgy laboratories, including a special chair of industrial metallurgy, to be endowed by sections of the nonferrous metals industry.

Most famous of the British cooperative industrial research laboratories, the Shirley Institute, which covers cotton, rayon, and silk textiles, has just an-

nounced that it is offering scholarships and fellowships at British universities to train in fundamental research methods young science graduates who subsequently will attain managerial positions in cotton mills.

Two illustrations of the practical way in which industry is attempting to overcome the serious shortage of chemical engineers revealed during the war years are the offer by the Shell group of oil companies to endow Cambridge University with 420,400 pounds to establish a school of chemical engineering, and the benefaction from the firm of Courtaulds to the Department of Chemical Technology of the Imperial College of Science, London, calculated to yield an income of 3,000 pounds a year in perpetuity, which will cover, among other needs, the establishment of a new chair of chemical engineering.

In order to ensure a more efficient and frequent interchange of scientific workers between industry and the universities, the London Midland and Scottish Railway Company (one of Britain's four main-line railways) has proposed, after consultation with the University Committee of Vice-Chancellors, that members of its research staff be appointed each year to do fundamental research in the university laboratories. It is hoped that the universities will invite these temporary workers in their laboratories to occupy part of their time in teaching. The universities, in turn, will be invited to send members of their staffs to work in the London Midland and Scottish Railway research laboratory at Derby, for agreed periods of about six months or a year, on applied aspects of fundamental problems in which they happen to be interested. These individuals would enjoy access to all the departments of the railway and would thus have the opportunity of seeing how the results of research are applied in large-scale railway development. The Railway Company's research laboratory is staffed by seventy university graduates and has sections dealing with engineering, metallurgy, chemistry, physics, paints, and textiles.

The Company is prepared to bear the bulk of the cost of this scheme, including the salaries and adequate allowances of both the railway and university research workers involved in the interchange. The Company hopes that the scheme will operate flexibly and on a multilateral basis rather than on a system of what might be termed "barter"; for example, one of the railway men might be sent to the engineering research staff at Cambridge, while the railway itself took a man working in that field from an institution such as Glasgow or Manchester University.

Significant among recent developments is the establishment of the Manchester Joint Research Council. This Council, sponsored jointly by Manchester Uni-

versity and the Manchester Chamber of Commerce, will assist in securing the effective application of the results of scientific research in industry, particularly in the northwestern part of England, where cotton and heavy engineering are the most important industries. An information service has been created which aims not so much at furnishing scientific answers to the problems submitted but at placing the inquirer in touch with the organization best able to deal with the particular subject. Regular meetings of the Council are now held in the Manchester area, and the scientists and the facilities at Manchester University and Manchester College of Technology will be available, where appropriate, to industrial firms in the region. A similar scheme is now being instituted at Leeds.

Finally, university research into the functioning of financial and business institutions in Britain and elsewhere, and the economic conditions affecting them, being encouraged by the fellowships and grants awarded by the Houbion Norman Fund, sponsored by the Bank of England.

It will have been observed that, in the development of these links between the universities and industry, there is no suggestion that the former should sacrifice their academic integrity, or be guided as to policy by industry, or, except in special circumstances, should put themselves at the disposal of industrial organizations. It cannot be doubted that in the long run the national well-being will be served by these schemes and others which, no doubt, will follow, for interlinking more closely knowledge and manufacture.

Wartime Research in Malaria

The Board for the Coordination of Malarial Studies

AN EXTENSIVE PROGRAM of research in the chemotherapy of malaria has been developed during the last four years through the efforts of a large group of university investigators sponsored and supported by the Committee on Medical Research of the Office of Scientific Research and Development. This program, integrated with that of cooperating industrial firms, is closely coordinated with malarial investigations in the Army, Navy, and U. S. Public Health Service through the Board for the Coordination of Malarial Studies. The functions of the Board are administered through facilities of the National Research Council provided by a contract between the National Academy of Sciences and the OSRD.

Useful knowledge has been accumulated on the biology of various malarial parasites, on their biochemical requirements, and on their behavior in different hosts. Studies on immunity in the avian infections have yielded information on the cross-immunization which obtains with different species of parasites. The immune response of human subjects to malarial antigen has not shown promise, either in the prevention or modification of the disease or in the production of complement-fixing antibodies which might be useful in differentiating between a latent infection and a cure in *vivax* malaria.

The studies in the chemotherapy of malaria have involved the screening of over fourteen thousand compounds for various types of antimalarial activities in various avian infections, a study of the toxicology and pharmacology of many of these compounds in laboratory animals, and a study of the potentialities of about

eighty in human malarias due to parasites of domestic and exotic origin. In the course of these investigations, the chemical and pharmaceutical industries have responded generously to requests for both small and large quantities of material for animal and clinic studies.

The net result of these investigations has been the discovery of antimalarial activity in compounds derived from a variety of structural types, and a clear definition of the problems involved in the suppression and cure of malaria. In addition, certain investigations have progressed to the point where the results have been of definite value in the treatment of malaria. The practical advances emanating from the program can be summarized in brief as follows:

(1) *The development of better methods for the use of quinacrine (atabrine) in the suppression and treatment of malaria, which led to the demonstration that this compound is superior to quinine.*¹ The development of an accurate specific method for the determination of the small amounts of quinacrine in plasma permitted the collection of information on the pharmacology of this drug in experimental animals and man, upon which was based a rational usage of the drug.

(2) *The development of compounds superior to quinacrine.* Among these are several members of the 4-aminoquinoline series. In this group, SN 761, 7-chloro-4-(4-diethylamino-1-methylbutylamino)quin-

¹ Statement of the Board for the Coordination of Malarial Studies. *J. Amer. med. Ass.*, 1944, **125**, 977.

² The Survey number, designated SN, identifies a drug in the records of the Survey of Antimalarial Drugs.

line, has received the most extensive exploration, both in civilian and military establishments. This compound is an effective suppressive, when administered no more frequently than once weekly in a well-tolerated dose. It will also cause an abrupt termination of the clinical attack of *vivax* malaria and will cure *falciparum* malaria when administered for only one or two days. In addition, it does not discolor the skin as does quinaecline, nor does it give the disagreeable gastrointestinal symptoms which are sometimes seen with the administration of quinaecline. Several other compounds in this same chemical series would also appear to be superior to quinaecline. Promising compounds in other chemical groups are under study. However, investigations with compounds of the latter types have not reached the stage of field trial. It is therefore not possible to make any statement concerning their practical usefulness at this time.

(3) *The exploration of the 8-aminoquinolines.* Dur-

ing the past year the exploration of promising leads to suppressive drugs has been extended; however, the major emphasis has been focused upon the study of the 8-aminoquinolines with the hope of uncovering a nontoxic curative agent. This line of investigation received impetus from published reports of British investigators in the early 1930's on the prophylactic and curative actions of pamaquin (plasmochin) in *vivax* malaria. Clinical investigators under OSRD contracts reappraised these actions. They have now demonstrated a curative action of pamaquin in *vivax* malaria due to both domestic and Southwest Pacific strains of *P. vivax*. However, there would not appear to be a sufficient "spread" between the minimal effective and the maximal tolerated doses to warrant recommendation of its use at this time. Other 8-aminoquinolines are being explored with the hope of developing a compound with the curative action of pamaquin but without its concomitant toxicity.

PERSONNEL OF THE BOARD

R. F. Loeb, *Chairman*; F. A. Butler, Comdr. (MC), USN; W. M. Clark, Chairman, Panel on Biochemistry; G. R. Coatney, U. S. Public Health Service; L. T. Coggeshall, Capt. (MC), USNR; F. R. Dieuaide, Col. M. C., AUS; A. R. Dochez, OSRD; E. G. Hakansson, Capt. (MC), USN; E. K. Marshall, Jr., Chairman, Panel on Pharmacology; C. S. Marvel, Chairman, Panel on Synthesis; O. R. McCoy, Lt. Col., M. C., AUS; W. H. Sebrell, U. S. Public Health Service; J. A. Shannon, Chairman, Panel on Clinical Testing; and G. A. Carden, Jr., Executive Secretary.

Association Affairs

Recent Elections of Officers for Terms Beginning in 1946

President (one-year term): James B. Conant, Harvard University

Members of the Executive Committee (four-year terms): C. F. Kettering, General Motors Research Laboratories; Fernandus Payne, Indiana University

Members of the Council (four-year terms): H. R. Aldrich, Geological Society of America; W. M. Krogman, University of Chicago

Vice-Presidents of the Association and Chairmen of the Sections (one-year terms):

Mathematics (A): R. E. Langer, University of Wisconsin

Physics (B): L. A. DuBridge, Massachusetts Institute of Technology

Chemistry (C): Henry Eyring, Princeton

Astronomy (D): G. VanBiesbroeck, Yerkes Observatory

Geology and Geography (E): John L. Rich, University of Cincinnati

Zoological Sciences (F): Alfred E. Emerson, University of Chicago

Botanical Sciences (G): E. C. Stakman, University Farm, St. Paul, Minnesota

Anthropology (H): Leslie Spier, University of New Mexico

Psychology (I): Sidney L. Pressey, Ohio State

Social and Economic Sciences (K): Frederick C. Mills, Columbia University

History and Philosophy of Science (L): Dorothy L. Stimson, Goucher College

Engineering (M): Henry T. Heald, Illinois Institute of Technology

Medical Sciences (N): Francis G. Blake, New Haven Hospital

Agriculture (O): M. A. McCall, U. S. Bureau of Plant Industry

Education (Q): Guy T. Buswell, Chicago

Science Legislation

Science Legislation and the Holiday Recess

Howard A. Meyerhoff

Executive Secretary, AAAS, Washington, D. C.

TWO PRE-HOLIDAY EVENTS have revealed both the President's and the Congress' interest in science legislation, but the avalanche of last-minute Congressional business relegated them to inside and inconspicuous places in the newspapers, and they may have escaped the attention of many scientists.

First in order of occurrence was the President's reply to the letter from Isaiah Bowman and his Committee supporting the Bush Report. The full text of the President's letter follows:

December 14, 1945

My dear Doctor Bowman:

Receipt is acknowledged of your letter dated November 24, 1945, on behalf of the newly organized Committee supporting the Bush report, regarding the science legislation now pending before the Congress.

I am keenly interested in the development of research and of the appropriate Federal assistance therefor. Brilliant results have been achieved by the scientists during the war. The people deserve these results in peace as well.

My views on the soundest form of Federal assistance have been stated both in my Message to Congress on September 6, 1945, and in the statements made by the Director of War Mobilization and Reconversion and the Director of the Budget.

These views were expressed after the fullest consideration of the best interests of all concerned, after consultation with scientists, with public administrators and with students of Government, after considering the Bush report and the committee reports on which it was based, and after weighing the views expressed in your letter which had previously been called to my attention.

I appreciate the interest taken in this subject by members of your Committee, and feel sure that their basic objectives of freedom of research, and non partisan administration of a program of aid to scientific research and education, will be attained under such an organization as I have recommended.

I am confident that I can count on them to support scientific research with the same zeal that has made our scientists so eminent.

Very sincerely,
(sgd) Harry S. Truman

Dr. Isaiah Bowman
President, Johns Hopkins University
Baltimore, Maryland.

The second event was the introduction into the Senate on 21 December of S. 1720, the science legislation after complete revision and redrafting. Sponsors of the newly drafted bill are Senators Kilgore, Johnson, Pepper, Fulbright, and Saltonstall.

The new bill has drawn heavily upon the testimony which was presented at the October hearings, as most scientists assumed and hoped it would. As it must translates the wishes of scientists into the practical terms of governmental procedure, and where it can not accept certain proposals, it offers—or attempts to offer—workable compromises. The text of the 11 page bill will be issued in a subsequent number of *Science*, and therefore only a skeleton analysis of its main features will be given at this time.

The unique feature of S. 1720 is the establishment of a strong board to function coordinately with a single director-administrator. The latter will be appointed by the President, by and with the advice and consent of the Senate. Within the proposed Science Foundation there shall be divisions of (a) mathematical and physical sciences, (b) biological sciences, (c) social sciences, (d) health and medical sciences, (e) national defense, (f) engineering and technology, (g) scientific personnel and education, and (h) publications and information. Associated with each division is a "divisional scientific committee."

The National Science Board consists of nine "qualified" members appointed by the President for three year terms, plus the chairmen of the several divisional committees. This Board may make recommendations directly to the President and the Congress, and the nine presidential appointees shall advise with the director in the appointment of the divisional committees. Members of the Board shall receive per diem compensation.

The bill provides for minimum percentage expenditures of 15 per cent each for national defense and health-medicine, and 25 per cent additional to be apportioned among the states for research and development.

While dedicating to the public patents, inventions and discoveries growing out of federally financed research, the bill provides for retention of patent rights by contractors or inventors when "fair and equitable"

and consistent with the national interest" and provided there has been substantial private contribution to the cost. Remaining sections provide for international cooperation, interdepartmental coordination, fellowships and scholarships, and a register of scientific and technical personnel.

This, in brief, is the bill to which attention should now be directed. It will completely supersede S. 1297 (the Kilgore bill), but Senator Magnuson is not committed. Whether he will attempt to get S. 1285 out of committee in response to the strong lobby started by the Committee supporting the Bush Report is not predictable. S. 1720 is a serious endeavor to meet the demand of the majority of the scientists by setting up a board of qualified men and by making this board a check and balance to the administrator, without nullifying the latter's responsibility to the President and the Congress. The chief patent issue is reason-

ably met without sacrificing the aim to bring some system to patent policy within Government laboratories. It compromises with the House and with the Military on the administration of the Division of National Defense, and it follows the wishes of the majority of scientists by including the social sciences.

It was in the conviction that the bill does combine the best features of the original legislation, and that it makes use of the best and most workable recommendations contributed by scientists at the October hearings, that Senators Fulbright and Saltonstall have joined in sponsoring the new bill. The latter is in committee and has been issued in the Preliminary Report (Subcommittee on War Mobilization Report No. 7, 21 December 1945) in order that scientists may study S. 1720 and comment before it is reported out of committee. The full text of the bill will be published in the next issue of *Science*.

The Committee for a National Science Foundation, formed at the invitation of Dr. Harold C. Urey and Dr. Harlow Shapley, and now located in the Hotel Astor, New York City, has issued a statement dated 28 December, 1945. It is addressed to Senators Kilgore, Magnuson, Johnson (Colo.), Pepper, Fulbright and Saltonstall. Its signers include Albert Einstein, Enrico J. Fermi, George R. Minot, Otto Meyerhof, J. Robert Oppenheimer, Harold C. Urey, Harlow Shapley and some 200 others. The text follows:

Knowledge secured by research has achieved public recognition as the necessary foundation of sound programs for national welfare, health, security and world order. It is clear that the magnitude of the research task which must be accomplished promptly in the interest of the nation and of civilization requires expenditures so great that government aid is required. The extensive public hearings just completed in Washington under the joint chairmanship of Senators Kilgore and Magnuson collected testimony from all sides which emphasized this point. Because it is believed that the public may be in doubt concerning the views of research men on the feasibility and practicality of scientific advance under government auspices, the following statements are made in the conviction that they are supported by the judgment of a majority of scientists:

1. Federal support of research must supplement funds for scientific inquiry from private philanthropic and business sources if science is to make its essential contribution to the welfare and security of mankind in the difficult years ahead.

2. The freedom of inquiry upon which science is dependent can and must be guaranteed for research under government no less than private auspices.

3. The government should support research in all fields of fundamental scientific inquiry relevant to national interest without arbitrary exclusion of any area.

4. Scientific findings resulting from Federally financed research activities should receive publication and should be dedicated to the welfare of the public.

5. The training of research personnel through national scholarships and fellowships for undergraduate and graduate study should be open to all on the basis of ability and scholastic achievement, and should be available for work in any qualified institution in any recognized field of science.

6. Although there is a serious division of opinion on the question whether administrative responsibility should be given to a governing board or to a single administrator, it should be possible to devise a plan of organization which will meet the major objections to either alternative.

These six points are in harmony with that part of President Truman's message of Sept. 6 to the Congress which urged the early establishment of a Federal agency to promote and support scientific research and aid to training of research personnel. An analysis of the testimony presented at the Senate hearings under the joint chairmanship of Senator Kilgore and Senator Magnuson on pending science bills indicates that there is sufficient agreement on these points to justify their utilization as a basis of legislation drafting.

The signers of this statement have a profound conviction that a program of Federal aid to research is vital to the national interest and that legislation acceptable if not wholly satisfactory to those who hold divergent points of view about particular questions of function and organization can be drafted. We stand ready to cooperate in the revision of the bills recently considered at the Senate hearings on pending national science legislation. Our purpose is to serve the national interest by securing the collaboration of the maximum number of qualified scientists in a united attack on the scientific problems confronting the nation.

A complete list of the signers will appear in the issue of 11 January 1946.

Technical Papers

The Lipotropic Properties of Inositol

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In the original report (2) of the discovery of the lipotropic effect of inositol and in subsequent publications (3, 4, 7) it was claimed that inositol exerts a specific effect upon the so-called "biotin fatty liver," which was believed to be the same as that produced by a beef-liver fraction. This was particularly interesting, since the "biotin fatty liver," which was stated to be resistant to choline, was supposed to be characterized by a high content of cholesterol. Inositol was reported to be more effective than choline in reducing the level of cholesteryl esters in the lipides of "biotin fatty livers" and also in those resulting from the feeding of cholesterol (7).

Beveridge and Lucas (1), in this laboratory, found that under certain dietary conditions, however, inositol was not more, but distinctly less, active than choline in reducing cholesteryl esters in liver lipides. Further work (to be published shortly) has shown that under all the experimental conditions chosen (21 comparative experiments) choline was at least equally, and usually more, effective than inositol in reducing bound cholesterol. It was invariably more active in reducing total lipides. Similar results were obtained in rats fed on fat-free diets, on diets containing fat, and on diets containing fat and cholesterol. When biotin was injected, choline was distinctly more active in reducing total lipides and was at least as effective as inositol in reducing bound sterols. In the prolonged experiments choline was much more effective than inositol in lowering the cholesteryl esters whether or not biotin was given.

No evidence has been obtained in this laboratory to suggest that there is any difference between the fatty liver produced by biotin and that caused by a high fat diet. The ratio of bound sterol to glycerid is the same in the presence of biotin as in its absence. Groups of rats (usually about 12 animals on each diet) injected with biotin (5 γ daily) responded just as well to choline as did those not receiving biotin. The biotin and nonbiotin groups responded to about the same extent to administration of inositol, this response being less than that produced by an equal quantity of dietary choline. The combined effect of choline and inositol is equally pronounced whether

biotin is present or absent. In a recent paper, McHenry (5) has retracted certain of his earlier statements concerning (a) the characteristics of the "biotin fatty liver" (i.e. its identity with that produced by feeding a certain liver fraction) and (b) the specific lipotropic properties of inositol on this "biotin fatty liver." Our experimental results, which confirm and extend McHenry's latest findings, lead us to advance further along this pathway and to conclude that there is no evidence that the "biotin fatty liver" exists as a unique phenomenon.

McHenry (5) has stated that "it is obvious that inositol is effective in preventing the fatty liver caused by the beef liver fraction, while choline is not." That the liver fraction contains choline¹ has been noted (6), but the fact seems to have been overlooked in explaining the apparently greater relative lipotropic effect of inositol than choline upon the fatty livers so produced. Addition of further choline had only a small effect, as might be expected. Addition of inositol produced the well-known synergistic lipotropic effect. McHenry (5) has stated that "the effect of a combination of choline and inositol is similar to that produced by the same amount of inositol alone." However, the inositol was *not alone* in his experiments, because the liver fraction which was fed contained large amounts of choline. It is obvious that the fatty liver produced by the liver fraction is somewhat resistant to choline, but McHenry's failure to mention the presence of choline in the liver extract has tended to overemphasize the role of inositol under these particular circumstances. It would be interesting to know the level of liver fat which would result from giving a choline-free liver fraction and to compare the relative effects of choline and inositol under such conditions. Experiments along these lines are at present being conducted.

We have conducted many experiments in which diets containing cholesterol were fed over periods from 3 to 16 weeks and have not noted any preferential effect of inositol in lowering either bound sterols or total lipides. In fact, the lipotropic effect of inositol, which was less than that of choline even in short-term "cholesterol" experiments, diminished in relation to that of choline as the experiments were prolonged. In contrast, little, if any, diminution in the choline effect was observed during 16 weeks.

¹ We are using a similar fraction, obtained from the same source, and by the ennea-iodide procedure have found 9 mg. per cc. of free choline and 24 mg. total choline. The latter figure has been confirmed by microbiological assay.

It may also be recorded here that inositol (30 mg. per day) has not, in our experience, been effective in preventing the occurrence of the hemorrhagic kidneys which develop in young rats on diets low in choline and methionine.

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TDE, 1,1-Dichloro-2,2-bis(*p*-chlorophenyl)ethane, as an Anopheline Larvicide

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Compounds related to DDT, including those present in the technical product, have been tested for their toxicity to fourth instars of *Anopheles quadrimaculatus* Say. One of these compounds, 1,1-dichloro-2,2-bis(*p*-chlorophenyl)ethane,³ hereinafter called TDE from the generic name "tetrachlorodiphenylethane," has been found to have a toxicity equal to, and in some forms of application greater than, that of DDT. Tests have been made to compare the toxicity of DDT and TDE when applied in acetone suspensions, dusts, and oil solutions. The methods used in testing acetone suspensions and dusts were those described by Deonier, *et al.* (*J. econ. Ent.*, 1945, **38**, 241-243).

Acetone suspensions. Tests comparing the initial kill of acetone suspensions of TDE and DDT are reported in Table 1. In this form the two compounds were not significantly different in effectiveness. TDE, however, is indicated to be better than DDT in its residual toxicity, as shown in Table 2.

In a comparison at 0.01 p.p.m., the average length of time required for complete knock-down of larvae was 0.81 hour for DDT and 1.166 hours for TDE.

Dusts. Table 3 shows that, when impregnated on talc and applied as a dust, TDE had a toxicity to

Anopheles quadrimaculatus equal to, or greater than, that of DDT. In other tests TDE has shown some indication of being superior against eulicine larvae.

TABLE 1
COMPARATIVE TOXICITY OF TDE AND DDT IN ACETONE SUSPENSIONS TO FOURTH INSTARS OF *Anopheles quadrimaculatus*
(20 larvae per test, 3 replications)

	Material	Mean mortality in:	
		24 hours	48 hours
TDE	p.p.m.	%	%
	0.0050	88.3	100.0
	.0033	68.3	93.3
DDT	.0025	58.3	95.0
	0.0050	83.3	96.6
	.0033	73.8	93.3
	.0025	55.0	81.6

TABLE 2
COMPARATIVE STABILITY OF TDE AND DDT WHEN APPLIED IN ACETONE SUSPENSIONS AT 0.01 P.P.M. AGAINST FOURTH INSTARS OF *Anopheles quadrimaculatus*
(20 larvae per test, 3 replications)

Material	Time between treatment and introduction of larvae	Mean mortality in:	
		24 hours	48 hours
TDE	Days	%	%
	0	98.6	100.0
	2	93.3	100.0
	4	100.0	...
	7	93.3	98.3
DDT	9	43.3	61.6
	0	100.0	...
	2	55.0	75.0
	4	3.0	8.3

Fuel-oil solutions. One of the difficulties encountered in laboratory comparisons of DDT in oil solutions is that the toxicity of the oil may affect the results where it is used in appreciable quantities. The smallest amount of oil that can be accurately measured is toxic when applied to a beaker or a pan. A spray chamber has been constructed in which larvae in small containers are exposed to small amounts of atomized spray. By dispersing a small quantity of spray in the spray chamber, larvae can be exposed to sublethal dosages of DDT or other materials in solutions.

In a spray chamber (8×8×8 ft.), 0.4 ml. of No. 2 fuel oil containing 0.5 per cent of DDT gave an average mortality of 76.6 per cent in 48 hours in three containers exposed simultaneously. Paired tests of TDE used at the same dosage gave 100 per cent mortality in 24 hours.

In further tests against fourth instars of *Anopheles quadrimaculatus*, the mean mortality of 0.4 ml. of No. 2 fuel oil containing 0.5 per cent of DDT was 55.8 per cent after 24 hours and 69.1 per cent after 48 hours. Against the same larval population 0.2 ml. of No. 2 fuel oil containing 0.5 per cent of TDE gave

¹This work was conducted under a transfer of funds, recommended by the Committee on Medical Research, from the Office of Scientific Research and Development to the Bureau of Entomology and Plant Quarantine.

²Acknowledgment is made to Sgt. Harry H. Incho for his valuable assistance in conducting the laboratory tests.

³The term "DDD" has been used for this compound, but the designation "TDE" seems preferable. The latter is used in order to avoid possible phonetic confusion with DDT and also because two proprietary products called DDD are on the market.

a mean mortality of 49.1 and 53.3 per cent. TDE in fuel-oil solutions appears to be definitely more toxic to anopheline larvae than DDT.

TABLE 3
COMPARATIVE TOXICITY OF TDE AND DDT WHEN APPLIED
AS A 0.1-PER CENT DUST IMPREGNATED ON TALC
AGAINST FOURTH INSTARS OF *Anopheles*
quadrimaculatus
(20 larvae per test)

Material	Dosage of active ingredient	Mortality in:	
		24 hours	48 hours
	Pounds per acre	%	%
TDE	0.00156	95	100
	.00156	100	...
	.00078	100	
	.00078	95	100
DDT	.00156	95	100
	.00156	95	100
	.00078	55	70
	.00078	75	80
Checks (untreated)	10	20
	5	15

These laboratory tests are only preliminary, but TDE shows sufficient toxicity to warrant further study. Although early advice indicated that the compound might be difficult to manufacture, from more recent information it appears that TDE may be manufactured on a large scale.

The Age of Jerome Bog, "A Carolina Bay"

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The unique elliptical depressions on the Coastal Plain of the Carolinas have received the attention of several physiographers, and three suggestions have been made as to how these depressions were formed. The most fascinating is that they were caused by a shower of meteorites (7). Cooke (4) has ascribed their origin to wind action and water currents in coastal lagoons. Johnson (6) has proposed an hypothesis of complex origin which involves artesian, solution, lacustrine, and aeolian factors. If the bays were formed by a shower of meteorites, their origin was simultaneous. On the other hand, if Cooke's hypothesis is correct, they could not possibly all be of the same age, since the bays are on different terraces. Likewise, if Johnson is correct, it is highly improbable that the time of origin was identical for all of them. Hence, if either Cooke or Johnson is

right, this report is of interest only with respect to the one bay under consideration, since it is based upon a study of the deposits in the bottom of only one depression—that lying just to the east of the hamlet of Jerome, Bladen County, North Carolina.

The age of the "Carolina Bays" has been suggested as late Pleistocene previous to mid-Wisconsin time (1). On the basis of the data now at hand it seems safe to say that at least the depression under consideration was formed during Wisconsin time and, specifically, about the time of the Wisconsin maximum glaciation in the East.

Evidence for this has been arrived at in the study of pollen from a series of peat samples taken every 6 inches to a depth of 7 feet and four samples at 6-inch intervals from lake clay underlying the peat. Below the clay is the hard, sandy bottom of the bay. Although the pollen spectrum constructed from the peat samples shows some evidence of climatic fluctuations, it does not indicate any severe change. About the level where the clay is reached, however, there is an indication of a cooler climate, and, within a foot of the bottom, elements of the boreal forest appear in abundance. Fir and pine pollens (possibly jack pine) are very common. (The jack pine, *Pinus banksiana* Lamb., was identified on the basis of the size-frequency technique developed by Cain (3).) But it is by no means a pure boreal forest that is represented. Oak and hickory are conspicuously present. The composition strikingly resembles the transition forests such as those of northern Minnesota today, where the northern conifers reach their southern limit and compete with the hardwoods (2). Farther down in the clay at the very bottom of the deposit, the pollen represents a forest reflecting a slightly less severe climate. Fir is scarce and black gum, a southern species, absent at the fir maximum of the younger clay, is present as it is in the peat above the clay.

Assuming that the pollen in the deposit records the vegetation of the surrounding region, one is led to the conclusion that at the time the lake sediments first began to accumulate in this bog the climate was moderately cold and was becoming increasingly colder, soon reaching a maximum and persisting only long enough for the accumulation of scarcely more than a foot of clay. Dr. W. H. Hobbs suggests in correspondence that the fir and pine pollen in this case may have been blown in from the higher Appalachians. It is true that some pollen is carried great distances and has, in fact, been collected at points all the way across the Atlantic Ocean (5). That this is certainly not the origin of the fir pollen in Jerome Bog is obvious when one considers the high proportion of fir pollen to other species. If other species were grow-

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ing in the vicinity, their contribution to the pollen would so greatly outnumber the fir, borne three hundred miles from the higher Appalachians, that the fir would be far below 1 per cent, rather than representing 12 per cent, of the tree pollen. Furthermore, fir is found only within the bottom 18 inches of the deposit, while extensive fir forests still persist in the higher Appalachians.

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News and Notes

Dr. Norman L. Munn, professor of psychology at Vanderbilt University, Nashville, Tennessee, has accepted the professorship of psychology at Bowdoin College, Brunswick, Maine, and will take up his duties at the latter institution in October 1946.

Rexford Guy Tugwell, Governor of Puerto Rico, has been appointed professor of political science at the University of Chicago. Dr. Tugwell will also direct a new program of education and research in planning, which opens 1 January 1946, in cooperation with the American Institute of Architects and agencies of the public administration clearing house.

Edward L. Bowles, expert consultant to the Secretary of War, was awarded a Distinguished Service Medal on 14 November 1945. Dr. Bowles, now an Army member of the National Academy of Sciences and the NRC Board for National Security, came to his present assignment from Massachusetts Institute of Technology, where as a professor he was head of Electrical Communications.

Dr. Franz R. Goetzel, of the Permanente Foundation, Oakland, California, has received a grant of \$3800 a year from the Whitehall Pharmacal Company for studies on the physiology of pain and the action of analgesic drugs.

Dr. Nandor Porges, formerly biochemist at the Southern Regional Research Laboratory, is now technical director in charge of the chemical and bacteriological laboratories conducting research and development for the Chase Chemical Company, Newark, New Jersey, pharmaceutical and manufacturing chemists.

Dr. Laurence S. Foster, formerly of the Department of Chemistry at Brown University, who for the past three years has been employed on the Manhattan Project at Brown, the University of Chicago, and Massachusetts Institute of Technology, has been ap-

pointed chief of the Metals Forming Branch of the Research Laboratory at the Watertown Arsenal, Watertown, Massachusetts.

Dr. Norman H. Cromwell, of the University of Nebraska, has been promoted from assistant professor to associate professor of chemistry.

Announcements

The University of California at Berkeley announces the establishment of a new Division of Medical Physics, which is incorporated within the Department of Physics, R. T. Birge, Chairman. John H. Lawrence, M.D., is head of the new division, and Joseph G. Hamilton, M.D., another member of the Medical School, is associated with him, as are Hardin B. Jones, Ph.D. (Physiology) and Cornelius A. Tobias, Ph.D. (Physics). Close liaison will be maintained with the Medical School and the Radiation Laboratory, as well as with the Department of Physics.

The division is housed in a new three-story laboratory a few hundred feet away from the 60-inch cyclotron building on the Berkeley campus. This laboratory, a gift of Mr. William H. Donner, is named after him, the Donner Laboratory of Medical Physics.

The fall semester, which began in October of 1945, marked the offering of one upper-division course entitled Medical Physics. This course gives an introduction to nuclear and radiation physics, electronics, biological effects of radiations, and an introduction to the tracer technique. Four additional upper-division courses are planned for the spring semester: an introduction to medical physics, photobiology, laboratory course in medical physics, and medical-physical aspects of aviation.

Two degrees are planned: a Ph.D. in Medical Physics for students who have earned the M.D. and a Ph.D. in Biophysics for others. These degrees will require the completion of a minimum number of

courses in the fields of physics, chemistry, physiology, mathematics, and medicine, to give a well-balanced basic medical physics background, and completion of a certain amount of original research in the laboratory.

In addition to the teaching functions, the division has an ambitious program of research outlined in the field of medical physics. For this purpose the 60-inch cyclotron and an RCA electron microscope are available in the group, together with the facilities of the Radiation Laboratory, the Physics Department, and the Medical School, both in Berkeley and San Francisco.

The University of Pennsylvania has created the new office of Director of Inter-American Activities and has appointed Dr. W. Rex Crawford to that post, it has been announced by Dr. George W. McClelland, president of the University.

Dr. Crawford, who will continue to serve also as professor of sociology at the University, recently returned to this country from Brazil, where he spent two years as cultural relations attaché at the American Embassy in Rio de Janeiro. In 1941 he was exchange professor at the University of Chile, in Santiago, under the provisions of the Buenos Aires Convention, and in 1942 he directed the Inter-American Training Center in Philadelphia for the Office of the Coordinator of Inter-American Affairs.

According to Dr. McClelland, the new directorship was established because of the University of Pennsylvania's long-continued interest in inter-American cultural relations, students from South America having been enrolled at the University as early as 1828.

An Institute of Atomic Research has been established at Iowa State College under the direction of Dr. Frank H. Spedding, professor of physical chemistry and director in charge of atomic research. The general purpose of the Institute will be to carry on investigations of possible application of atomic energy to the various fields of activity of the college: agriculture, engineering, science, veterinary medicine, and home economics. For the present, research also will be continued with certain other projects started during the war period. The work of the Institute will be closely correlated with the general research of the Division of Science under Dean H. V. Gaskill. Two new appointments have been made: Dr. L. Jackson Haslett, assistant professor of physics, began work on 1 January, and Dr. John F. Carlson, associate professor of physics, will join the staff on 1 April. Iowa State College will work in close cooperation with the University of Iowa, which is establishing an Institute of Nuclear Research.

The University of Rochester has established a neuropsychiatric clinic at the School of Medicine and Dentistry, which has been made possible through a gift of \$2,153,954 from Mrs. Helen Rivas, of Leroy. This is in addition to the building fund for the new structure, the cost of which is tentatively estimated at about \$600,000. Construction of the clinic is expected to start early in 1946, and it is hoped that the building will be completed within a year. It will face Crittenden Boulevard adjacent to Strong Memorial Hospital, and will be connected with the hospital by a corridor. It will be five stories high and will contain physical and occupational therapy and recreational facilities for patients, with ample laboratory space for research and investigation.

Ten American universities have been offered fellowship awards in a five-year program for postgraduate studies in food and nutrition financed by Standard Brands, Inc. The annual grants will be awarded to college graduates with high scholastic records who wish to continue their studies for postgraduate degrees in biochemistry, organic chemistry, microbiology, and chemical engineering. The universities to which the grant has been offered are: Cornell University in bacteriology; Harvard University, Indiana University, and Princeton University in organic chemistry; the Massachusetts Institute of Technology in chemical engineering, biology, or food technology; the University of Pittsburgh and the University of Wisconsin in biochemistry; and Rutgers University, Yale University, and Stanford University in microbiology. Selection of the fellows will be made by each university where the fellowship is awarded, entirely free from any influence by Standard Brands. Neither will there be any restrictions or specifications imposed on the students by the company.

Fundamental research benefits at Ohio State University through a grant of \$100,000 from its Research Foundation. This sum, according to Dr. A. R. Olpin, secretary and executive director of the Foundation, represents a return to the University for the use of facilities in governmental and industrial research. It is taken from the research reserve of the Foundation accumulated through earnings from patent licensing and other sources. It is expected that all or most of it will be used in the creation of fellowships at the University. The fund will be allocated under the direction of President Bevis, with the concurrence of the director.

The University of Leeds has received a gift of 50,000 pounds from Charles Brotherton, president of the chemical engineering firm of Brotherton and Company, Yorkshire, to establish a laboratory in chemi-

engineering. In addition, Mr. Brotherton made an immediate gift of 5,000 pounds for the same purpose.

Turner and Newall, Ltd., London, have provided funds for eight research fellowships in engineering, inorganic chemistry or physics, or allied sciences, these fellowships to be financed by them for a period of seven years. The fellowships are to be established at specified universities in areas in which the company has certain of its larger factories and will be known as "Turner and Newall Research Fellowships." Manchester University will have four; the University of London, two; Leeds University, one; and the University of Durham, one. The fellowships will each be worth 600 pounds a year, and the universities will accordingly receive 33,600 pounds over the seven-year period.

The Museum of Science and Industry, Rockefeller Center, New York, has opened a Navy exhibition of weapons and war equipment, with a view to informing the public of naval research and development work during the war as well as pointing to the need for continuing a "research engineering program" in the postwar period. Among the exhibits are radar devices; radio-controlled bombs; rockets; jet-propelled, radio-guided missiles; proximity fuses; and a variety of other weapons, many of which are being viewed by the public for the first time. In addition to having an opportunity to operate certain of the equipment on display, visitors may have a radar-scope view of New York as it appears to a bombardier. The relationship of the various atomic units to each other is demonstrated by a three-dimensional figure of an atom of Uranium 235, magnified 279 billion times—a feature of the exhibit.

The First Inter-American Typhus Conference met in Mexico, D.F., 7-13 October 1945, at the invitation of the Secretaría de Salubridad y Asistencia of Mexico. The Institute of Inter-American Affairs and Pan-American Sanitary Bureau collaborated with the Secretaría de Salubridad y Asistencia in calling the Conference. Representatives from Central and South America and the Caribbean Area and from the United States, particularly delegates of the Armed Forces, met with the Mexican workers on typhus for a complete week of discussion of the distribution of rickettsiae in America; the isolation and classification of rickettsiae; the epidemiology of typhus; the diagnostic methods of rickettsiae; prophylaxis of typhus; clinical, hematological, and therapeutic phases of typhus; problems of nomenclature and the control of typhus during the present war and plans for its control in the postwar period.

The recent experience with the use of typhus vaccine

and the utilization of DDT and other insecticides in the prophylaxis of typhus made the calling of the Conference a timely event.

The Metropolitan Section of the American Physical Society, at its meeting in New York on 9 November 1945, passed a Resolution calling for "the immediate removal of all restrictions on the publication of scientific information. . . . Any restriction of research will not only be contrary to the tradition of science but will delay the development of scientific research in this country. Advantages which may accrue from regimenting science for military secrecy will be more than offset in the long run by the disadvantages caused by hampered communications among scientists, the difficulties of training young scientists, and the general discouragement of scientific initiative."

A corollary of the first Resolution, not reproduced here, had as its objective the immediate removal of censorship on "scientific information." It called for the formation of a board, composed largely of scientists and engineers, charged with the responsibility of distinguishing between scientific information and detailed technologies. The Society does not oppose secret technologies.

The Society has taken the position that, in the interest of world peace and our national security, our Government should "take immediate steps through the existing framework of the United Nations Organization to call a conference for the purpose of working out machinery for international control of armaments, especially those involving atomic power," and recommends that "the United Nations Organization be encouraged to set up an international commission of scientists to advise on technics through which such control might be exercised."

The Tennessee Academy of Science passed the following Resolution at its fifty-fourth meeting at George Peabody College for Teachers, Nashville, Tennessee, on 1 December 1945:

That the Tennessee Academy of Science vote concurrence in the ideas expressed in the letter of 24 November 1945, addressed by Isaiah Bowman and others to the President of the United States, strongly favoring the Magnuson bill and opposing the Kilgore bill; and

That members of the Academy be urged to study the letter, and compare the bills, and write their Representatives and Senators in Congress concerning their judgments; and

That members of the Academy believe wise decisions as to sponsoring scientific research and training scientific personnel are vital to our Nation's future, and should be taken promptly, boldly, and without com-

promises that would make the programs of sponsorship weak and ineffective.

Henry B. Bryans, executive vice-president and director of the Philadelphia Electric Company, was unanimously re-elected to serve a third term as president of the American Standards Association. *Frederick R. Lack*, vice-president and manager of the Radio Division, Western Electric Company, Inc., was elected vice-president. The other officers of the American Standards Association announced at the Annual Meeting, held at the Hotel Biltmore, New York, on 7 December are: *E. C. Crittenden*, assistant director of the National Bureau of Standards, as chairman of the Standards Council, and *L. F. Adams*, General Electric Company, as vice-chairman.

Dr. W. Albert Noyes, Jr., chairman of the Department of Chemistry at the University of Rochester, has been elected president of the American Chemical Society for 1947. Colonel Bradley Dewey, president of the Dewey and Almy Chemical Company, Cambridge, Massachusetts, is to be president of the Society for 1946. Other officers have been announced as follows: *Dr. Charles A. Thomas*, director at large; *Dr. Charles L. Parsons*, director for the Fourth District; and *Dr. Samuel C. Lind*, director for the Sixth District.

W. A. Pennow and R. T. Burns, Westinghouse Electric Corporation engineers, have recently developed an indicator which utilizes a tri-colored beam of light to guide a pilot attempting a landing at night. The pilot of a plane approaching the landing strip from too steep an angle sees an amber beam projecting from the indicator located on the near end of the field. If the approach is too low, a red beam warns him away. The go-ahead signal is a beam of green light, between the amber and the red, which the pilot follows in until the wheels contact the ground.

The Corporation explains that the "night eyes" are provided by an optical system containing only five basic parts. Light from a 100-watt incandescent bulb is gathered and focused on a color filter, which splits up the white light into three bands—amber, green, and red. These bands are projected through a special double convex lens which focuses the rays into sharp beams. Between this lens and the color filter is located a shutter that opens and shuts 40 times per minute to give a blinking effect to the beam, thus making it more distinguishable to the pilot. The whole mechanism is contained in a housing the size and shape of a small searchlight.

The beam is visible, under all conditions except fog, for a distance of three miles, giving the pilot ample time to get his bearings and make any corrections in

his approach angle. In addition, the indicator is equipped with a dial for adjusting the angle of the beam to fit the different landing speeds of planes. With ten possible adjustments available, the indicator can accommodate itself to the landing speed of every plane now flying. It should prove most valuable at small airports and for private planes, where cost of radar- or radio-directional equipment is prohibitive.

Meetings

The Third National Conference of the Sciences, Professions, Arts, and White Collar fields will be held in the Engineering Societies Building, 29 West 39th Street, New York, Friday, 11-12 January 1946. On the program for the first day is an informal reception and registration at 7:00 P.M., followed by a public session at 8:00 P.M. A series of panel discussions at 10:00 A.M. on Saturday will cover the topics: Full Utilization of the Sciences and Professions; International Cooperation; Full Employment Opportunities; Standards of Living. The findings of the Conference will be summarized at 2:30 P.M.

This is the Third Annual Conference arranged by the *National Council of Scientific, Professional, Art, and White Collar Organizations*, which maintains offices at 1860 Broadway, New York 23, N. Y. The officers of the organization are: *Dr. Kirtley F. Mather*, President, *Miss Olive Van Horn*, Secretary, *Dr. Alex Novikoff*, Treasurer, *Evelyn Adler*, Executive-Director, and *Dr. Donald Dushane*, *Dr. Mordecai Johnson*, *Dr. Philip White*, and *Lewis Merrill*, Vice-Presidents.

The American Sociological Society will hold its next meeting at the Hollenden Hotel, Cleveland, Ohio, on 1-3 March 1946.

The Crystallographic Society, organized at Harvard University and Massachusetts Institute of Technology in 1939, is planning to resume its activities which were suspended during the war. The Society concerns itself with the science of crystallography and its applications to such fields as Physics, Chemistry, Metallurgy, Ceramics, and Biology, and is not restricted to the classical phases of crystallography commonly associated with mineralogy.

In 1940 this Society initiated the idea of launching a *Journal of Crystallography*. More recently, several Societies have discussed plans to replace the *Zeitschrift für Kristallographie*, no longer being published. Since there is no other journal devoted exclusively to crystallography, the Society is taking an active interest in this new development.

A meeting is tentatively planned for 21-23 March 1946 at Smith College. Those wishing to present papers are requested to send titles and brief abstracts

to Prof. M. J. Buerger, Massachusetts Institute of Technology, Cambridge 39, Massachusetts.

All those wishing to renew membership or to become members of the Society or who desire further information may write to William Parrish, Acting Secretary-Treasurer, The Crystallographic Society, Philips Laboratories, Inc., Box 39, Irvington, New York.

The American Association of Cereal Chemists will hold its 1946 annual meeting at the General Brock Hotel, Niagara Falls, Ontario, Canada. The meeting is scheduled for 13-16 May, with a preconvention registration taking place on Sunday, 12 May. Dr. Oscar Skovholt, Quality Bakers of America, is National President and will preside over the meeting. Members of the Association are urged to make their hotel reservations early. Excellent facilities are provided not only by the General Brock Hotel but also by the nearby Foxhead Inn, and by the Hotel Niagara, Niagara Falls, New York, which is within walking distance of the headquarters hotel.

Conditions Abroad

Dr. Jaroslav Drbohlav, former chief of the Division of Microbiology of the Czechoslovak State Institute of Health in Prague, Czechoslovakia, has communicated with Dr. Oscar Felsenfeld, chief research bacteriologist, Mount Sinai Medical Research Foundation of Chicago. Dr. Drbohlav is well known in America not only for his co-authorship of the first medium used for the cultivation of *E. histolytica*, but for his work at Harvard University and his studies of tularemia in Europe.

Dr. Drbohlav and his associates were cut off from the world during the six years of German occupation. Out of the six chiefs of the divisions of the State Institute of Health of Czechoslovakia, four were executed by the Germans, Drs. Drbohlav and Vaniček being the only survivors. The Institute, built with the aid of the Rockefeller Foundation, was operated by the Germans and used for the production of sera and vaccines. Dr. Drbohlav was expelled, but expects now to be reinstated. He states that the worst suffering has been "to be cut off from American and English scientific literature." He reports that the conditions in Czechoslovakia are bad. The country lacks food (mainly fats and proteins), tobacco, coffee, etc., and there is an urgent need for medicaments and materials for medical use.

Dr. Stefan Blachowski, acting president of the University of Poznań, and Polish editor for the *Psychological Abstracts*, writes to Dr. Walter S. Hunter, of Brown University, that he is where he can receive books and reprints and journals. Practically all of Dr. Blachowski's personal effects, as well as the Psy-

chological Institute and the offices of the Polish *Psychological Quarterly*, have been destroyed. Plans are now being made to start publication of the latter journal, and work has already been begun at the University, which needs both books and apparatus.

Prof. Karol Starmach, of the Ichthyobiological Institute at Krakow, writes that after a sojourn at the German concentration camps of Dachau and Sachsenhausen he has returned to the Institute and his research on the bottom organisms of Polish rivers and streams.

Dr. Bernard E. Read, of the Henry Lester Institute for Medical Research, Shanghai, China, has recently returned to this country after two and one-half years' internment by the Japanese in Shanghai. He reports that the Institute has been returned to its Trustees with the majority of its equipment gone and all radiators and similar fittings removed. The library, however, is complete. Considerable time will be required before the Institute can function normally again. Dr. Read's present address is 18 South Buck Lane, Haverford, Pennsylvania.

Recent Deaths

Dr. Edwin W. Kemmerer, 70, retired Walker professor of international finance at Princeton University and financial adviser for fourteen governments during a period of thirty-one years, died 16 December 1945.

Major Sir Thomas Selby Lawson-Tancred, 75, British archeologist and author, died on 15 December 1945. The ninth baronet of his line, he served with the British Army in India and in the World War.

Dr. Roy Jay Holden, 75, geologist and member of the faculty of Virginia Polytechnic Institute for forty years, died on 16 December 1945 at his home on the campus.

R. D. Landrum, a widely known ceramist and a former president of the American Ceramic Society, died on 30 November 1945 in Cleveland, Ohio, after an extended illness. Mr. Landrum was 63 years of age. Mr. Landrum was associated with the Harshaw Chemical Company for a period of 21 years. In the period just prior to his death he was engaged in the sales development of synthetic optical crystals grown from fused salts, a rather recent Harshaw specialty.

Newton G. Evans, 71, professor of pathology and director of research at the College of Medical Evangelists, Los Angeles, died on 19 December 1945 after an extended illness.

Dr. Olin F. Tower, 73, professor emeritus of chemistry at Western Reserve University, died at his home in Mount Dora, Florida, on 21 December 1945.

Government Support for Research Associations in Great Britain¹

Mr. Herbert Morrison, addressing the Conference of Industrial Research Associations on 6 November declared that we need research workers to-day as much as in 1940 and that the Government will do everything possible to encourage British industry to use scientific research. It is essential that some of the money gained to industry by relief from taxation in the new budget should be invested in research. Large concerns, he hoped, would establish or extend their own research departments, but smaller concerns should give their full support to existing research associations, for no single section of industry can do without this essential scientific partnership and remain virile. Moreover, Government support of industrial research must be backed by readiness to use its results, and firms which can not maintain fully equipped research staffs of their own should employ at least some trained scientific workers who can cooperate with the appropriate research association and help in the interpretation and application of its work.

Expenditure on research should be regarded as an essential cost and, dealing with the finances of research associations, Mr. Morrison said that with larger incomes the research associations would be able to carry out more of the expensive development work. The Government has therefore decided that in suitable cases it will make single grants to finance capital expenditure for such special purposes as buildings and re-equipment, the purchase of particularly expensive apparatus or the provision of semi-scale plant. Until a research association attains an appropriate scale, the present system of a block grant and an additional grant will continue. Eventually, the additional grant will cease, but a new block grant will be made, to continue indefinitely so long as the Department of Scientific and Industrial Research is satisfied with the activities of the association. The associations, Mr. Morrison said, can rely on the Government to proceed as rapidly as possible with the release and training of promising research workers, and all possible assistance will be given for rebuilding or extending laboratories. Sir Edward Appleton, referring to the importance of first-class research workers, pointed out that a monastic life is not stimulating to the young scientific worker, and there should be the closest contact between the research associations themselves, and with the universities and other research establishments.

¹ From *Nature*.

Dental Teaching and Research in Great Britain

It is reported in The Times, London, that dental teaching and research in Great Britain will be aided by grants from the Nuffield Foundation. One of the general aims of the trustees is to support research which promises to help people to be healthier. After promoting schemes for the advancement of child health and industrial health, they have, with Lord Nuffield's approval, turned their attention to dental health, an urgent question in view of the widespread incidence of dental disease.

On expert advice the assistance provided by the foundation is to be in three parts: First, grants amounting to 9,000 pounds a year for 10 years to four university dental schools to enable them to develop in various ways their research work on preventive dentistry; second, the provision of Nuffield Dental Fellowships designed to improve the supply of dental research workers and teachers; third, a few scholarships to enable dental students of outstanding ability to receive a more thorough scientific training.

The dental schools to which grants have been made are the Sutherland Dental School, University of Durham; the University of Leeds Dental School; the Turner Dental School of the University of Manchester and Guy's Hospital Dental School.

The Nuffield Dental Fellowships will be open to three groups of candidates—those with dental qualifications, university graduates in medicine, and thirdly, those holding a university science degree. Fellowship holders will be required to obtain some scientific or other training as may be necessary to qualify themselves to undertake teaching and fundamental research on dental health and disease.

Normally the annual value of a fellowship will be between 400 and 800 pounds. It may be awarded for one or more years, but as a rule for not longer than three years. Travelling expenses will be paid to fellows who go abroad for study.

The scholarships available for dental students are intended for candidates who, in the opinion of the dental school, would profit by receiving during the course of training additional instruction in anatomy and physiology. A scholarship will normally be tenable for only one year, but in suitable cases may be renewed for a second year. It will provide tuition fees and a subsistence allowance not exceeding 200 pounds a year.

In the Laboratory

Black Fly Incubator-aerator Cabinet

LYELL J. THOMAS

University of Michigan Biological Station and
University of Illinois

The writer, in need of large numbers of parasite-free black flies, designed the cabinet described below. It has been in operation each summer for the past five years and has supplied all the black flies required for experimental and taxonomic use.

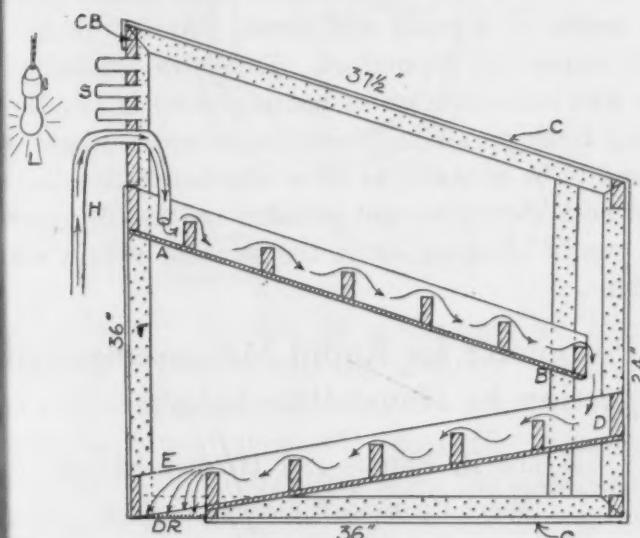


FIG. 1. Black fly incubator-aerator, side view cut away to show operation and construction of the interior.

The cabinet consists of a frame made of 1×2 -in. pine lumber covered with heavy dark canvas. Cypress would probably be superior to pine for this purpose. The front of the frame is 36 in. high and 18 in. wide. Near the top, on the front side, is a compo-board, CB, 1 in. thick, bored to accommodate a dozen $\frac{1}{4} \times 2\frac{1}{2}$ in. shell vials, S. One of the holes is used for a hose connection, H, with a lake-water supply faucet. Inside the cabinet, just below the compo-board, is a wooden trough, AB, with sides 4 in. high and a bottom 18 in. wide. At intervals throughout the length of the trough, 3-in.-high baffles are arranged to make a series of pockets to form a riffle board. This trough is sloped to the back so that the water, when turned on, spills over into a similar riffle-board trough, DE, which in turn carries the water off to a drain, DR, in front. The drain is covered with fine-mesh, copper-wire screen to prevent any flies from escaping at this point. The canvas cover, C, is tacked on all but one side, where the flaps are buttoned or pinned. These flaps may be rolled back to allow easy access to the riffle boards from the side. The canvas on the bottom

of the cabinet is tacked near the drain so that it is constantly soaked with water. The evaporation of the water up the sides of the cabinet serves as a method for cooling the interior.

Vegetation, covered with eggs, larvae, and pupae of black flies, is collected from a stream, brought back to the laboratory in minnow buckets half-filled with water from the stream, and placed in the shallow compartments formed by the baffles. The water in these buckets is then poured into the upper trough in order to save any larvae which detach from the vegetation while in transit. Within a day or two most of the larvae are attached to the baffles. The canvas side-flaps are closed tightly, and an electric light, L, is turned on in front of the vials in order to attract into them the emerging flies. The males appear first, followed later by the females. One filling of the troughs from a field collection will last for several weeks. Flies are collected in the vials daily. The effect of an abundant food supply on the flies will be noticed within a week or two, as these later-emerging flies are much larger than those caught in the wild.

Although the cabinet has been used primarily to collect black flies, it will work equally well with chironomids, caddis flies, and other rapids-inhabiting insects.

Sintered Glass Disks

ARTHUR D. MACK

Naval Medical Research Institute, Bethesda, Maryland

A method is described for the laboratory manufacture of sintered glass disks of various sizes and porosity. The disks include a glass ring which gives them increased strength, resistance to mechanical shock and easy removability for cleaning or replacing by a disk of another porosity. In this laboratory these disks have been used successfully in funnels in connection with rubber gaskets known as "double rubber cup washers" which are obtainable from any plumbing supply house. The details of this assembly are presented in the accompanying illustration.

To make the disks, a pyrex glass ring of the desired size is cut from glass tubing, placed on a galvanized iron plate and heaped to overflowing with powdered pyrex glass screened to a size which will give the desired porosity. The plate is then placed in a furnace (preferably muffle) at 975° C. for about eleven minutes and then removed and allowed to cool. Depend-

ing on the size of the furnace, the time may be varied by a minute or two, in order to produce proper adhe-

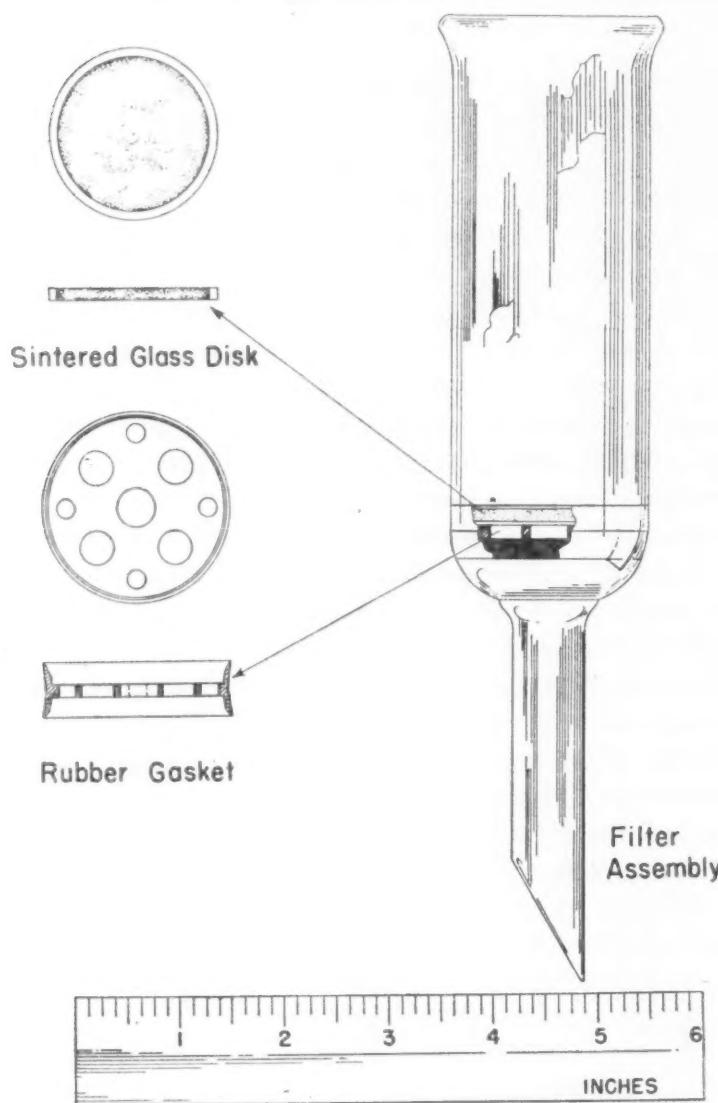


FIG. 1

sion of the pyrex granules to themselves and to the ring. The disk may be polished by rubbing against a flat glass plate with powdered glass as an abrasive.

Attachment of Electroencephalographic Electrodes

CHESTER W. DARROW and JULIAN H. PATHMAN

Institute for Juvenile Research, Chicago

A perpetual problem in electroencephalography has been to secure an expeditiously applied, electrically stable, comfortable, and readily removable attachment of electrodes to the scalp. After trying various methods, most workers return to the use of flattened solder pellets with electrode paste, attached to the scalp by collodion (F. A. and E. L. Gibbs. *Atlas of electroencephalography*. Cambridge, Mass.: L. A. Cummings, 1941). This method requires an air blast for drying the collodion. If electrode paste is rubbed into

the scalp area to reduce skin resistance, the collodion does not adhere readily, and, once satisfactorily applied, is difficult to remove from the scalp and hair without the use of objectionable solvents.

The possibility that a more satisfactory material than collodion might retain the general advantages of the technic while eliminating its disadvantages led us to experiment with other adhesive materials. Having found a paraffin wax of low melting point (47° to 49° C.) very satisfactory and having used it ourselves for the past year, we wish to call the attention of others to its advantages.

After massaging a point on the scalp with a finger tip moistened with a commercial electrocardiograph paste, an electrode with a bit of paste is placed on the area, and it is painted over with melted paraffin by means of a small stiff brush. At 50° to 55° C. this causes no discomfort. Excessive hardening of the wax and elevation of melting point is avoided by using fresh paraffin. Electrodes so applied have been found to be as stable as those attached with collodion, and both electrodes and paraffin are readily removed by gently scraping away the paraffin with a coarse comb.

A Potometer for Rapid Measurements of Ingestion by Haustellate Insects

MABLE R. FRINGS and HUBERT FRINGS

West Virginia Wesleyan College

In an investigation of the nutrition of the blowfly, *Cynomyopsis cadaverina*, it was necessary to measure accurately amounts of food ingested by individual flies. Gravimetric methods for this are exact, but they are time consuming. To facilitate these measurements, therefore, a potometer was developed to make these determinations volumetrically. This potometer, beside its utility in studies on nutrition of flies, should be valuable as a tool for the rapid measurement of ingestion in testing the toxicity of insecticides. With appropriate modifications, it could easily be adapted for use with haustellate insects other than flies.

The construction of this instrument is illustrated in Fig. 1. It consists of a piece of capillary tubing, bent as shown, with a scale graduated in millimeters fastened to it by means of small pieces of wire. The bore of tubing used would be determined by the amounts of ingestion expected. One end of the tubing is slightly expanded and a small wick of filter paper (not shown in the figure) is inserted.

The potometer is filled at the plain end by means of a pipette, and the meniscus brought onto the scale by absorbing the excess fluid with a piece of filter paper applied to the wick. The insects are allowed to

suck the fluid (a sucrose solution, in the experiments with *Cynomyopsis cadaverina*) from the capillary tube through the filter paper, and the amounts ingested are measured in millimeters by following the movement of the meniscus along the graduated scale.

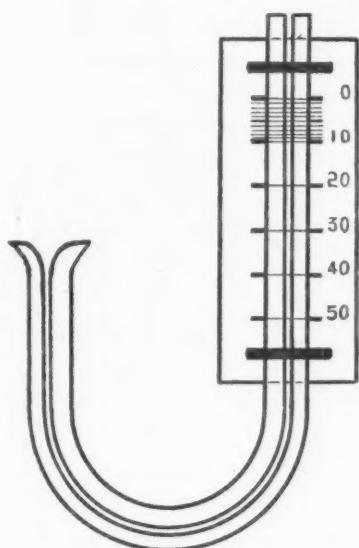


FIG. 1. Construction of the potometer. The bore of the capillary tubing is greatly exaggerated.

To convert amounts in millimeters, an obviously arbitrary measurement, to absolute volumes, the potometer must be calibrated. To do this, it is necessary merely to determine the weight of mercury represented by each centimeter along the scale, and then to convert this, using the density of mercury, into the volume represented. Benedetti-Pichler (*Introduction to the microtechnique of inorganic analysis*. New York: John Wiley & Sons, 1942. Pp. 256-260) gives complete detailed directions for such calibrations. With solutions of known concentration, the exact amount of dissolved material ingested by the individual animal can be measured readily when the potometer is thus calibrated.

One possible correction factor suggests itself. The fluid is evaporating from the wick during the feeding of the insect, and it would seem to be necessary to correct for the rate of evaporation. In our experiments the wick was kept so small that the oral lobes of the flies practically covered it in feeding, thus stopping this evaporation. Also, the rate of evaporation with sugar solutions, and even with distilled water, was found to be so low that there was no appreciable loss through this route for the short time during which each fly fed. This factor, therefore, can be eliminated with appropriate precautions, or it can easily be determined and taken into account in the readings.

Using this potometer, a preliminary study was made of the correlation between time of feeding and amount

of fluid ingested to determine to what degree time of feeding could be used in place of amount. Twelve flies (6 males and 6 females) were used in the tests. These flies were mounted for ease of handling by fastening them on blocks of beeswax at the ends of glass rods. They were fed .5 M sucrose solution at 12-hour intervals, with distilled water supplied before each feeding. The results are presented graphically in Fig. 2.

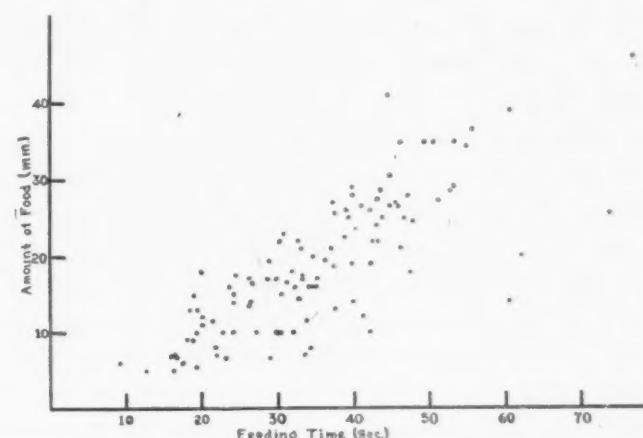


FIG. 2. The relationship between time of feeding and amount of food ingested for *Cynomyopsis cadaverina*.

There is obviously a high degree of correlation between time of feeding and amount of food ingested by this species, the coefficient of correlation (r) being .80 (Fisher's $z=1.1$). With long times of feeding, however, as the graph shows, the time of feeding may not be an accurate index of the amount. This is probably due to the tendency on the part of some individuals of this species to allow the proboscis to remain extended after reaching satiety, thus giving a time record without really ingesting any food. For work in which a high degree of accuracy is not necessary, the time of feeding is obviously a good measure of amount of food ingested. Where precision is necessary, however, in the measurement of actual amounts, the feeding time is invalid.

A New Glass Device for Staining Cover-Glass Preparations¹

RALPH WICHTERMAN

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Frequently biologists and others who are obliged to work with preparations affixed to cover glasses use methods whereby individual cover glasses must be transferred through fixing fluids, stains, alcohols, and clearing media before being mounted on slides.

¹ Cover-glass staining devices have been described by F. Baer (*Stain. Tech.*, 1929, **4**, 59-60), R. H. Bowen (*Stain. Tech.*, 1929, **4**, 57-58), and T. T. Chen (*Stain. Tech.*, 1942, **17**, 129-130). However, one who has experienced the staining of large numbers of cover-glass preparations should find obvious advantages in this new glass device.

Two such methods are widely used: In one, the cover-glass preparations are handled in Petri dishes, each of which accommodates about seven cover glasses. In this method there is always the danger of one cover glass sliding upon another and damaging the preparation. The other method requires the use of special staining wells which are grooved to receive four cover glasses. In both methods the cover glasses must be handled individually with forceps. This is not only tedious when large numbers of preparations are to be stained, but it is difficult or impossible to have all preparations stained for exactly the same lengths of time.

To overcome the objection to the use of Petri dishes and ordinary staining wells, I have constructed a device which permits the staining of ten cover-glass preparations (or twenty when placed back to back) in a single operation. The device (Fig. 1) consists of a slotted glass carrier to hold the cover-glass preparations, a spring-type handle for the carrier, and a glass container with lid for the reagent. The carrier is small and compact, with ten grooves on the inside of each of the long sides. Into these grooves are placed the circular or square cover-glass preparations of the size most commonly used, namely, 22 mm. ($\frac{7}{8}$ in.) wide. A thin strip of glass at the bottom and center of the carrier holds the cover glasses in place, and the space on each side of this strip permits the fluids to enter and cover the preparations when placed in a dish of reagent. In a staining procedure, there are frequently ten or more different reagents into which the preparations are to be passed. Of course, there should be a dish for each reagent. The size of the glass carrier ($5.5 \times 2.5 \times 4$ cm.) is such that two of

these can be placed side by side in the standard glass dish that is ordinarily used for the carrier holding 1×3 -in. glass slides.

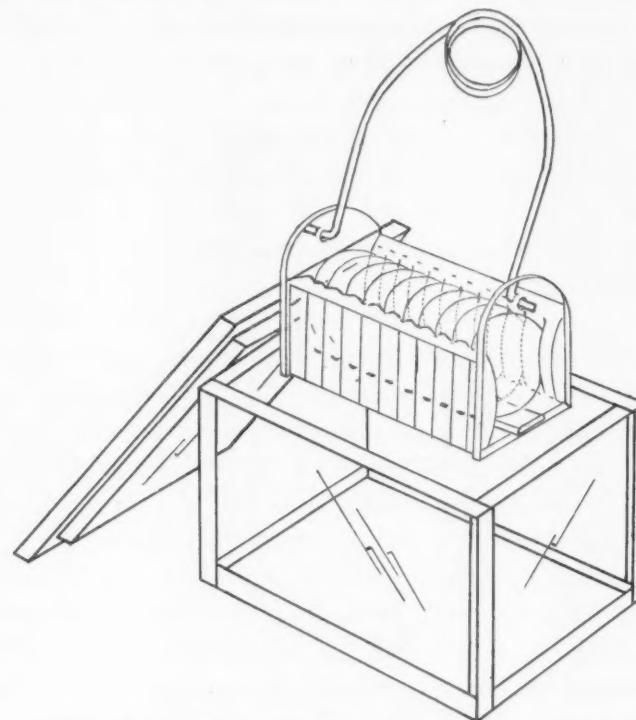


FIG. 1. Device for staining preparations mounted on cover glasses. The open-bottomed glass carrier with wire handle is shown with ten cover glasses in place for staining. Glass dish and lid are also shown.

Protozoologists, parasitologists, cytologists, bacteriologists, and others, especially those working with blood smears on cover glasses, should find the device useful. Its use in the Feulgen staining reaction is apparent. Not only does it eliminate what has been a very tedious and time-consuming operation in the past, but also it enables one to obtain uniformly accurate results in working with large numbers of preparations.

Scanning Science—

At the fortieth meeting of the Geological Society, on January 9th, the first paper read was by Mr. R. T. Hill, of the U. S. Geological Survey, On the Agassiz Expedition to Panama and Costa Rica.

The speaker made acknowledgment to the following specialists who had determined for him many different types of material entering into this complicated section: to Dr. Wm. H. Dall, of the Geological Survey, for a report upon the Tertiary Mollusea; to Prof. R. M. Bagg, of Johns Hopkins University, for interest-

ing determinations of the Tertiary Foraminifera; to Prof. J. E. Wolff, of Cambridge, to whom the petrographic specimens were assigned; to Mr. H. W. Turner, of the Geological Survey, for minute examination of certain important and apparently indeterminate earths; to Mr. Ahe Sjorgren, of Stockholm, Sweden, late of Costa Rica, for carefully prepared sections and collections; and to Mr. T. Wayland Vaughan, of the U. S. Geological Survey, for determination of the fossil corals.

—24 January 1896

Letters to the Editor

Growth of Trophoblast in the Anterior Chamber of the Eye of the Rabbit

Criteria which have been established for characterizing malignant tissue by means of the technique of transplanting tissue fragments into the anterior chamber of the eye of rabbits appear to be fulfilled by trophoblastic tissue. Trophoblast obtained from human placentae of about five-month pregnancies grows rapidly in the anterior chamber and infiltrates the eye. These results confirm similar work performed by Kido in 1937 (I. Kido. *Centralbl. Gynaek.*, 1937, 61, 1551; *Ber. wiss. Biol.* (Maly's), 1937, 44, 493). Experimental details will be published elsewhere.

CHARLES GURCHOT and ERNEST T. KREBS, JR.
San Francisco, California

The Pelletier and Caventou Monument in Paris

Among the bronze monuments melted down for conversion into weapons in the countries overrun and occupied by the Nazis in World War II was the statue of the pharmacists, Pelletier and Caventou, the discoverers of quinine, erected in Paris in 1900 and paid for by contributions from all parts of the world.

It would be an excellent manifestation of good will if American scientists, if the American people, would replace the destroyed statue by another and more beautiful one. The new monument would stand not only as a renewed tribute to a scientific deed of highest value to the human race but simultaneously as a symbol of the victory of humanity over brutality.

If this suggestion meets with general approval, a committee should be formed to deal with the questions concerned (collection of necessary funds, communication with the Société de Pharmacie de Paris, the American and French authorities, etc.).

The undersigned would be only too glad to aid in the realization of this project to the best of his ability.

GEORGE URDANG, *Director*
American Institute of the History of Pharmacy
Chemistry Building, Madison, Wisconsin

Some X-Ray Crystallographic Data on DDT

In the course of an X-ray and optic study of analogues of DDT we have had occasion to include DDT itself. Our results do not agree completely with those reported previously by G. L. Clark and F. W. Cagle, Jr., in a note to this journal (*Science*, 1945, 101, 465-466). DDT crystallizes in the orthorhombic system, and our lattice dimensions agree fairly well with those reported. Beyond this point no agreement exists.

The material used was a highly purified sample of DDT obtained through repeated recrystallizations from ethanol, having a melting point of 108.5-109° C. The crystals

were long tabular needles. An optic study showed the β vibration direction to be along the needle length. DDT is a positive biaxial crystal with γ normal to the main face. These data agree with the optic study made by E. L. Gooden (*J. Amer. chem. Soc.*, 1945, 67, 1616-1617).

X-ray data were obtained from Weissenberg diagrams about all three crystallographic axes. The unit cell dimensions are:

OUR DATA	CLARK, <i>et al.</i>
$a = 19.14 \pm .08$ A. U.	$a = 19.25$
$b = 9.96 \pm .04$	$b = 10.04$
(needle axis) $c = 7.85 \pm .04$	$c = 7.73$

The space group is P_{bc} or P_{bcm} and not P_{221} , as previously reported by Clark and Cagle. The density was measured by suspending the crystals in an aqueous KI solution of the same density, which was 1.556. There are four molecules per unit cell. The X-ray molecular weight is 353 as compared to 354.5 computed for $C_{14}H_9Cl_5$.

Powder diagrams check with the data published in *Science*, but we have been unable to confirm the indices assigned to many of the lines.

I. FANKUCHEN, M. SCHNEIDER, and J. SINGER
Polytechnic Institute of Brooklyn

The Best Defense

The challenge hurled at civilization by the atomic bomb not only provides motivation for men of different nations to live in peace, but also signalizes a procedure by which they may learn how to do this. For if, by employing the scientific method, men can come to understand and control the atom, there is reasonable likelihood that they can in the same way learn to understand and control human group behavior.

It is most unfortunate that science is being considered in the current press as merely the body of knowledge mankind has amassed about certain phenomena. During the Middle Ages an equally tremendous body of knowledge was accumulated which was in no way science. The important thing about science is the method of observing, classifying, and generalizing so that the body of knowledge is verifiable. This method has proved more useful in each field in which it has been exploited than any other method employed in that field.

Human behavior, like atomic behavior, is a natural phenomenon, capable of observation, classification, and generalization according to the same rules by which science has been so successful wherever it has been applied to natural phenomena. It would seem evident, therefore, that *social science*, in the strictest sense, offers a defense against further use of the atomic bomb with a greater probability of success than any other method now known.

Three or four years ago when warring peoples desperately felt the need of victory, it was not thought for a moment that this motivation alone would produce victory.

Techniques were required. It is equally absurd now, when peace is such a desperate necessity, to suggest, as men of intelligence are doing, that *the motivation provided by the fear of the atomic bomb will alone keep the peace* without the aid of techniques. It is quite within reasonable probability that social science can provide these techniques if it is given anything like the amount of support afforded to physical science in developing the atomic bomb.

The notable acceleration since 1930 in the gains made by social scientists, and the presence in the world of perhaps a few dozen of these men who are highly skilled in the techniques of their discipline, augurs well for a trial of the scientific method in discovering ways of maintaining peace. It is not as if a start had to be made from total ignorance. There is already at hand a very considerable body of knowledge as well as steadily increasing excellence in the means of enlarging it.

But while the social scientists seemingly must be responsible for discovering a means of preventing war, if it is to be discovered, the physical, biological, and medical scientists are at present possessed of nearly all the tremendous prestige that goes with the word *science*. Up to now no authoritative voice of any considerable group of physical, biological, or medical scientists has been raised in support of their co-workers in social science—of those who share their method of observing, classifying, and generalizing natural phenomena.

These more famed colleagues of the social scientist are probably not versed in his recent accomplishments; perhaps they are not fully aware that he uses the same method of science that they use; more than likely they have formed their opinions after listening to quacks posing as social scientists.

Is it not time for physical, biological, and medical scientists, whose prestige is so great, to investigate the work of social scientists thoroughly enough to ascertain whether it is, in truth, science? And if they find that it is, can they not do more toward keeping the peace than merely informing persons in authority, and others, of the terrible consequences of the atomic bomb in case of a war? Can they not unite and give their great influence to support the work of social scientists toward finding techniques by which the peace will be maintained?

RAYMOND E. BASSETT

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Gorham, Maine

On Opening "Frozen" Vacuum Desiccators

I have read with interest the method for opening "frozen" desiccators described by J. D. Reid (*Science*, 1945, 102, 483), which consists of driving a single-edged razor blade between the top and body of the desiccator. I have used this method myself successfully, but have always felt lucky that I did not chip or crack the top of the desiccator, since desiccator waxes of thick consistency are sometimes so tenacious that removing the lid becomes a major operation.

The method I have come to adopt is absurdly simple

but always effective, and in the event that someone may not yet have discovered the method for himself I shall describe it here. The desiccator is held under a hot-water faucet, the water being allowed to flow over the edge of the lid. As soon as it becomes warm, the wax softens, and the lid is removed with ease. Only a few seconds are required to perform the entire operation.

WILLIAM A. Hiestand

Purdue University

Information Please

In the early 1890's a one-room country school in Indiana was attended by two boys—classmates, both of whom became starred scientists. They have often wondered whether any other one-room country school in the United States has ever numbered two starred scientists among its alumni. The authors of this note, who were the boys referred to above, hope that any reader of *Science* who knows of a parallel or similar case will present the facts in a communication to this magazine. The likelihood of an occurrence of this kind by pure chance is not known but must be very small. If, as might reasonably be estimated, there is not more than one chance in a thousand that such a school has enrolled even one starred scientist, the likelihood of its enrolling two would be only one in a million on the basis of chance alone. In the instance here reported the laws of chance may have been upset by the fact that the teacher of the boys was exceptionally capable and inspiring.

It is suggested that replies to this appeal include instances of other comparable recognition—membership in the National Academy of Sciences, listing in *Who's Who*, etc.—and that mention be made of extraneous factors that may have been involved.

B. and T.

The Rumbling of Thunder

Arthur Taber Jones (*Science*, 1945, 102, 407) calls attention to an especially continuous and pronounced case of the rumbling of thunder on the morning of 30 August 1945, at Northampton, Massachusetts, and cites W. J. Humphreys, who, in *Physics of the air*, lists four causes for the rumbling of thunder: (a) inequalities in the distance from the observer to various points of the path of the lightning; (b) crookedness of the path; (c) succession of discharges; and (d) reflection.

There is no doubt that all these factors enter into the cause of the rumbling of thunder; but there occurs to the writer another cause which he believes to be even more potent than any of the four named above. As is well known, thunder is caused by the sudden change in temperature of the air through which electricity is passing during a lightning flash. In order to understand clearly the operations of the factor about to be described, let it be supposed that lightning flashes between two clouds so situated that the electric discharge comes directly toward the observer. When the discharge starts from the cloud of lower potential, we may assume the number of elec-

trons, N , per unit of time to be very great. These N electrons are accelerated by the difference of potential between the clouds and, after having been accelerated, meet with molecules of the air; and in thus colliding with the molecules generate light quanta—the light of lightning. Part of the light thus generated, however, is absorbed by electrons in other molecules, in their immediate neighborhood. These absorbing electrons are liberated as photoelectrons or beta electrons and become a part of the electron beam which constitutes the lightning discharge. The original electrons which started from the negative cloud and made collision with air molecules after the initial collision recoil and are free electrons in a potential field. There are now $2N$ electrons in the discharge per unit of time. These $2N$ electrons are now accelerated, make collisions with molecules, and generate light quanta. This process is repeated many times during the discharge of electricity from the negative cloud to the positive cloud. At each repetition of the process the number of electrons in the discharge is doubled, so that there occurs in the electric discharge $N, 2N, 4N, 8N, \dots$ It is the generation of the radiation—ultra violet, visible, infrared, and radiant energy radiation—which produces the heat, which causes the expansion, which, in turn, sets in motion the air waves we hear as thunder. The rate at which the lightning travels between the clouds is nearly, though not quite, that of light. The rate at which sound travels is only a small fraction of the velocity of light. If, now, the lightning is traveling toward the observer and the sound is traveling in the same direction, the sound produced by the lightning in the last part of the lightning flash will reach the observer first; and since the number of electrons in the discharge, having doubled at each collision with molecules, have increased possibly a hundred-thousandfold, the heat expansion would be comparable and the thunder would be heard as a loud crash, at first, followed by a gradually decreasing rumble, fading out to a very low rumbling sound coming from the beginning of the discharge.

If the lightning discharge takes place away from the observer, the sound of the first part of the discharge will be heard first, and the thunder will gradually increase in loudness, ending with a loud crash.

If the discharge is in any direction other than the two mentioned, the thunder will be heard as some variant of the two patterns described. The time of the lightning discharge is very brief, as the duration of the flash indicates. The reason why the thunder is prolonged is due to the difference in the distance of the different parts of the discharge from the observer.

In the case referred to by Professor Jones there must have been a very great number of lightning flashes passing in different directions between different clouds. The fact that there was no visible lightning was unusual but entirely understandable to the science of electrical discharge. When electrons collide with molecules of air they generate radiant energy quanta, but not necessarily of visible frequencies. The low-frequency radiation generated produces heat, and the consequent expansion of the

air produces thunder. We may therefore have a thunderstorm without visible light.

The above cause of the rumbling of thunder has been deduced from a general theory, not yet published, of electric discharges through air. There is no doubt that the four causes mentioned by W. J. Humphreys will have their influence in causing rumbling, but I believe that the chief cause for rumbling is the one elaborated above.

SAMUEL R. COOK

Sacramento, California

"Freezing" Behavior in Rats

Dr. Riess is properly conservative in the title of his recent article, "A possible explanation of 'freezing' behavior in rats," (*Science*, 1945, 102, 570), but the conclusions drawn in the report go somewhat beyond the data presented. It is stated that eighteen of the 124 rats raised in groups of six to a cage manifested the behavior in question, whereas only two of the "other group," raised in isolated, single cages, did so. The data are, of course, quite uninterpretable, statistically or otherwise, without a statement of the size of the "other group." Furthermore, the author evidently feels that his observations carry the implication of a connection between submissiveness, as developed in a social situation, and "freezing" behavior in the maze. Since three (of the eighteen) animals living in groups were "dominant and winners in fighting" (the other fifteen being submissive individuals), and since two animals who presumably had no opportunity for social interaction also showed "freezing," it would be more correct to say that the behavior may be related to social factors, or that social conditions seem to be a factor in producing the phenomenon, than to conclude that the behavior is "the result of the hitherto uncontrolled factor of social interaction in the living quarters of the experimental animals."

Prompt communication to fellow scientists of experimental results having wide current interest is certainly desirable and to be encouraged, but this desideratum is neither incompatible with, nor warrants the abandonment of, the usual standards of scientific reporting.

HENRY W. NISSEN

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A Correction

In a recent note, "A possible explanation of 'freezing' behavior in rats" (Bernard F. Riess. *Science*, 1945, 102, 570), the author was guilty of a serious omission which completely vitiated the meaning of the article. A comparison was made between two groups of animals, one living in multiple-animal cages, the other in isolation. In giving a description of the groups, the population of the multiple-housed animals was given as 124 and that of the second group was inadvertently omitted. There were 84 animals in this second group. This makes it possible to evaluate the difference between the two groups. The author apologizes for the omission.

BERNARD F. RIESS

Hunter College

Book Reviews

Experimental catatonia: a general reaction-form of the central nervous system and its implications for human pathology. Herman Holland de Jong. Baltimore: Williams & Wilkins, 1945. Pp. xiv + 225. \$4.00.

According to de Jong, catatonia is a neuromuscular reaction-pattern which, in its predominant hypokinetic form, is characterized by diminution of spontaneous motility, maintenance of static posture (catalepsy), and passive resistance to, or reversal of, induced movement (negativism); however, hyperkinetic tremors and impulsivity may also appear. The author acknowledges that a catatonic syndrome occurs in many diverse neurologic and psychiatric disorders, but he is primarily interested in the so-called "catatonic" subgroup of schizophrenic psychoses. In early studies at Amsterdam University (*La catatonie experimentale par la bulbocapnine*. Paris: Mason, 1930) de Jong, Baruk, and co-workers observed that significant alterations of muscular tonus and movement could be induced in animals by the injection of bulbocapnine, an alkaloid chemically related to apomorphine; the author therefore inferred that catatonic schizophrenia might also be of toxic etiology in man.

The present volume presents abstracts of subsequent studies by the author and his associates at Columbia and, more recently, at Duke University. In brief, these studies showed that the motor and autonomic symptoms of catatonia could be induced by a great variety of other drugs, such as mescaline, epinephrine, acetylcholine, and even CO_2 inhalations, so that the author's original quest for a specific "catatonizing chemical nucleus" had to be abandoned. Further, while "the extent to which catatonic manifestations could be produced [by bulbocapnine] seemed to be related directly to the degree of development of the nervous system of the experimental animal [Lewis]," the catatonic states induced by experimental lesions of the brain could not be directly correlated with either the localization or the size of the lesions themselves. Catatonic disturbances of muscular tonus were also produced by an Eck's fistula or by the ligation of an intestinal loop in dogs, by passing electric currents (especially of the direct-interrupted Leduc type) through the brains of cats, or even by subjecting rats to rapid horizontal rotation or to intense auditory stimulation. Still in pursuit of a possible toxic factor in clinical catatonia, the author next undertook extensive research on a substance in human urine hopefully called "catatonine" (later shown to be "operationally identical" with nicotine and not specific for schizophrenia), on the histamine content of human blood, and on the cephalin-cholesterol flocculation test for liver function in schizophrenics and normals—all with indeterminate results. De Jong concludes, nevertheless, that catatonia is an expression of "cellular asphyxiation in the nervous system" and implies that the latter, as Kraepelin postulated, is probably due to some undetermined "auto-intoxication" of the body.

It may be seen that de Jong's approach to neuro-psychiatry is still traditionally dualistic: an abstract "mind" is distinguished from a material "body," and all problems of behavior must be solved in terms of tissue function. From this orientation there follows his insistent pursuit of a single organic cause for "catatonic schizophrenia," which, clinically, is a vaguely defined, protean, and highly variable disorder contingent on a multitude of biodynamic determinants in the past experiences and current adaptive functionings of the organism.

Even granting the validity of so narrow an approach to the subject, the book has other, though less serious, defects. The discussion is thin and repetitious; records of the experiments are fragmentary and sometimes do not support the conclusions; the studies of other workers in the field are accorded scant notice; and the lack of an index makes cross-reference to the text difficult. Nevertheless, the work represents a sincere effort to report an almost life-long series of studies by an alert, competent, and persistent investigator and, as such, will furnish significant data to those interested in the comparative investigation of normal and abnormal behavior by valid and promising methods of animal experimentation.

JULES H. MASSERMAN

University of Chicago

American Old and Middle Tertiary larger Foraminifera and corals. Pt. I: American Paleocene and Eocene larger Foraminifera. Thomas Wayland Vaughan. Pp. x + 175; *Pt. II: West Indian Eocene and Miocene corals.* John West Wells. Pp. iii + 25. New York: Geological Society of America, 1945. Memoir 9.

This memoir is divided into three sections, the first two of which are by Vaughan and the third by Wells. The first portion describes the larger Foraminifera collected by Dr. A. Senn in Barbados, British West Indies, from rocks of Paleocene and Eocene age. The second section is a detailed account of the skeletal structure, development, and classification of the genera and species of the foraminiferal family Discocyclinidae, followed by a rather complete annotated list of the various American species assigned to this family. The final section of this memoir is a description of twenty-seven species of Eocene corals from Barbados and two species of coral from the Miocene of Martinique.

In Barbados, in the Joes River mudflows, there occur fossiliferous blocks which contain an assemblage of Paleocene larger Foraminifera. Most of the species recovered from these blocks are identical to those described from the Soldado formation on Soldado Rock, Trinidad. The formation from which these blocks were derived is not exposed.

The oldest exposed rocks are the Scotland formation, which is divided into a lower and an upper portion. The lower contains only one species, *Discocyclina (Discocyclina) grimsdalei* Vaughan and Cole. As this species appears to have a rather long stratigraphic range, the correlation of the Lower Scotland formation depends on



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the stratigraphic position of the formation. It is believed to be Lower Eocene. The Upper Scotland formation, which is subdivided into three members, contains a relatively rich fauna of larger Foraminifera and corals. Unfortunately, most of the latter represent new species, and the age of the Upper Scotland formation must be based on the general aspect of the fauna. The occurrence of *Pseudophragmina perpusilla* (Vaughan) and *Endopachys maclurii* (Lea) in this fauna, however, is a rather definite indication of the Middle Eocene age of the Upper Scotland formation.

In the systematic descriptions of the forms from Barbados, Vaughan describes a new genus *Orbitolinoides*, which resembles *Orbitolina* but lacks the peripheral zone crossed by radiating plates which is characteristic of the latter genus. Voluminous notes are given on the genus *Miscellanea*, and the various species of the Discocyclinidae are described and figured in great detail. A pustulate species of *Amphistegina*, related to *A. lopeztrigoi* Palmer from the Middle Eocene of Cuba, is described by Cushman in this section of the memoir. The description of a new species of *Polylepidina* and unnamed *Pliolepidina* concludes the section on the fauna from Barbados.

The second section will be of tremendous value to all students of the Foraminifera, since it represents a monographic treatment of the American Discocyclinidae. The discussion of the various species is preceded by an elaborate account of the structure of the test. Vaughan demonstrates by means of microtome thin sections, prepared by Dr. E. H. Myers from specially treated specimens, that one species of *Discocyclina* has annular intramural and radial intraseptal canals, confirming previously held opinions that the Discocyclinidae should be separated from the Orbitoididae and Miogypsinidae.

The classification adopted by Vaughan is essentially the one given by Vaughan and Cole in Cushman's textbook on the Foraminifera, with the addition of the subgenus *Asterophragmina* proposed by Rao in 1942. In the review of American species Vaughan proposes six new species and two new varieties and gives notes or detailed descriptions for forty-six previously described species and three varieties. The systematic portion of the second section would have been more valuable if a complete synonymy had been given in each case.

The second section is concluded by the stratigraphic zonation and geographic distribution of the American species of Discocyclinidae as well as a table in which the locations of the type specimens are given. The illustrations are excellent. Special notice should be given to the many perfect thin sections, because, if these are inadequate, it is impossible to obtain satisfactory photographs and delineation of diagnostic structures.

The final section, by Wells, describes the scleractinian coral fauna of the Upper Scotland formation, in which twenty-seven species and varieties were discovered. Although most of the species and two of the genera are new, the general aspect of the coral fauna is that of the Middle Eocene Claiborne coral fauna of the United States and not similar to other known West Indian Eocene coral assemblages. The fauna suggests that the forms lived in

a tropical, nonlittoral environment at depths beyond the lower limits of temperature for vigorous reef growth. Of the two corals described from the Miocene of Martinique, one was known previously from a single Dominican specimen, and the other, a new species, is referred to the subgenus *Eusthenotrochus* previously recorded from the Eocene of the Paris Basin and the recent seas.

W. STORRS COLE

Cornell University

Introduction to organic chemistry. (6th ed.) Alexander Lowy, Benjamin Harrow, and Percy M. Apfelbaum. New York: John Wiley & Sons, 1945. Pp. xiv + 448. \$3.50.

The sixth, revised edition of this textbook incorporates changes from the preceding edition which represent a steady evolution to keep the book up to date rather than a sudden change. The book therefore retains its essential qualities—clearness, simplicity, and logic of presentation—and avoids the pitfall of numerous other texts which, in their recent revisions, have tried to cover too much and have become unsatisfactory hybrids between elementary textbooks and advanced treatises.

Here we have, as the title claims, a true introduction to organic chemistry. It uses some electronic notations discreetly. The reviewer has quarrels of only minor importance with the authors. Although recognizing that the book seldom explains a topic in terms of something that follows, he finds the paraffins, prepared from acids, and the olefins, prepared from alcohols, in chapters where the students have not yet learned oxygenated functions. It seems more logical to teach that alcohols are hydrated olefins than that olefins are dehydrated alcohols. The description of recent industrial achievement is seldom permitted to distort the general knowledge, yet the description of the nitroparaffins is misplaced, because it destroys the notion of paraffinic sluggishness which it is essential for the student to grasp. The same criticism applies to rearrangement on aluminum chloride, which confuses the student when it is brought up too soon. These topics could easily be displaced into a separate chapter in which it could be emphasized that such reactions become preponderant because of the drastically different operating conditions. The reviewer would also like to see the Wurtz reaction emphasized as one of theoretical, more than practical, interest, since he finds that students are unusually prone to propose any number of condensations using this apparently obvious procedure.

The book is well presented and makes a distinctly better impression than its preceding edition.

ALBERT L. HENNE

Ohio State University

Introduction to industrial chemistry. W. T. Frier and Albert C. Holler. New York: McGraw-Hill, 1945. Pp. xiv + 368. \$3.00.

This book, written for the benefit of industrial employees taking night-school work, covers a number of independent, apparently hand-picked topics, as shown by the Table of Contents: atoms; molecules and valence; plus and minus valence; radicals and acids; acids, bases, and

salts; energy relations in chemical reactions, reduction and oxidations; production of iron and steel; slags and high-temperature chemistry; aluminum; magnesium; other applications of electrochemistry; the manufacture of chemicals; silicates, glass, and colloids; ceramic and cement; industrial water; fuels and combustion, organic chemistry (theory); plastics; rubber; and the refining of petroleum.

A first reading gives at once the impression that the authors are in earnest and are trying their best in the interest of their students, for whom they obviously feel a warm sympathy. It may be that this is the type of semiscientific information which is best suited for the purpose. The reviewer feels, however, that it is preferable to present the subject in the frankly untechnical manner of writing for the intelligent layman to be found in the *New York Times*, for example. The present method uses repeatedly oversimplified information, which is quite all right, but includes chemical terminology in sufficient quantity to disguise this fact, and the reviewer feels that this may give the students the impression that they know more, or understand more, than they actually do. The reviewer also looks askance at the kind of similes introducing Chapter II, which liken the desire of the atoms to live together in molecules to the fact that a man will be attracted by the earth if he walks off a roof, or to the difficulty of pulling apart two surfaces of polished metal. Since the book is to be used by novices, it would be well to use pictures of molecular models made of colored balls and pegs. The Hirschfelder models are admittedly more correct, but they do not speak to the imagination of the uninitiated.

ALBERT L. HENNE

Ohio State University

Physics of the twentieth century. Pascual Jordan. (Translated by Eleanor Oshry.) New York: Philosophical Library, 1944. Pp. xii + 185.

Those interested in the philosophy of science, whether they be professional scientists, philosophers, or intelligent laymen, will welcome this discussion of the epistemology of modern physics. Well written in nontechnical terms and apparently excellently translated (though the reviewer has not had access to the original) the book discusses first the assumptions of classical physics, followed by a lucid treatment of the simpler facts of modern physics and the revision in methodology which these facts, particularly quantum and wave mechanics, have made necessary.

The author, like some others, prefers the positivistic approach to the problems involved in attaining scientific knowledge. He considers metaphysical speculation concerning the *essence* of physical reality as unprofitable and dangerous to science, thus limiting the "philosophy of science" to a consideration of scientific epistemology or ways of knowing. "Up to our time," he writes, "the opinion has remained that it is the task of philosophy to clarify certain 'final' and most general questions of natural science; questions which concern perhaps the 'existence' of matter or the 'existence' of time and space or the 'existence' of force or the 'final' bases of 'ex-

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WAYNE B. DENNY

Oberlin College

Check-list of birds of the world. (Vol. 5.) James Lee Peters. Cambridge, Mass.: Harvard Univ. Press, 1945. Pp. xi + 306. \$5.00.

This is the most recent unit of the indispensable synopsis of avian taxonomy begun by this author in 1931. The plan in no way differs from that of the earlier segments. The usefulness of the work and the prevailingly high quality of Peters' taxonomic judgments are well known to every professional ornithologist. The accuracy and scholarship of the writing are of the first order. No treatise of this scope has been undertaken since completion of the now-outmoded *Handlist of the genera and species of birds* in 1909 by Sharpe.

Peters' Volume 5 deals with the following orders: Apodiformes (Trochilidae only), Coliiformes, Trogoniformes, and Coraciiformes. The hummingbirds, or Trochilidae, occupy over half the work and are a particularly difficult group. The genera of this family total 123, although there are only 327 species. One wishes for some organization of these genera into subfamilies. Basic revision of the hummingbirds is not feasible in the course of preparation of a world check-list. Peters largely follows Simon, the latest reviewer, but stresses the fact that generic differentiation has been overdone and offers a good point of advice for future students—construction of a system of generic classification based on the characters of the more conservatively differentiated female hummingbirds. The author records many worthwhile observations on hybrids, artifact trade skins and allocations of names and types such that substantial progress in the taxonomy of the group is made.

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mingbird biology that require this direct experience. The prospect of a definitive revision from the indoor school of "trochilidists," dealing largely with hummingbird "curios" imported from unfamiliar regions, seems slight indeed.

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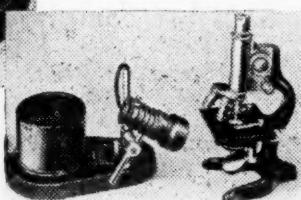
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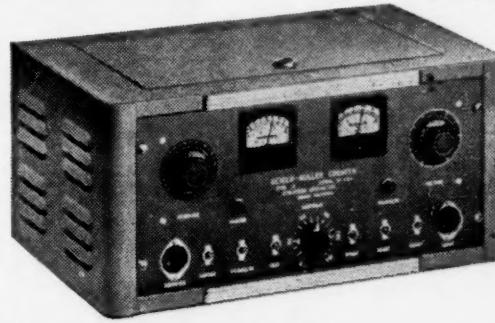
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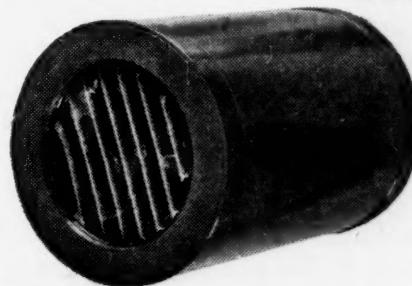
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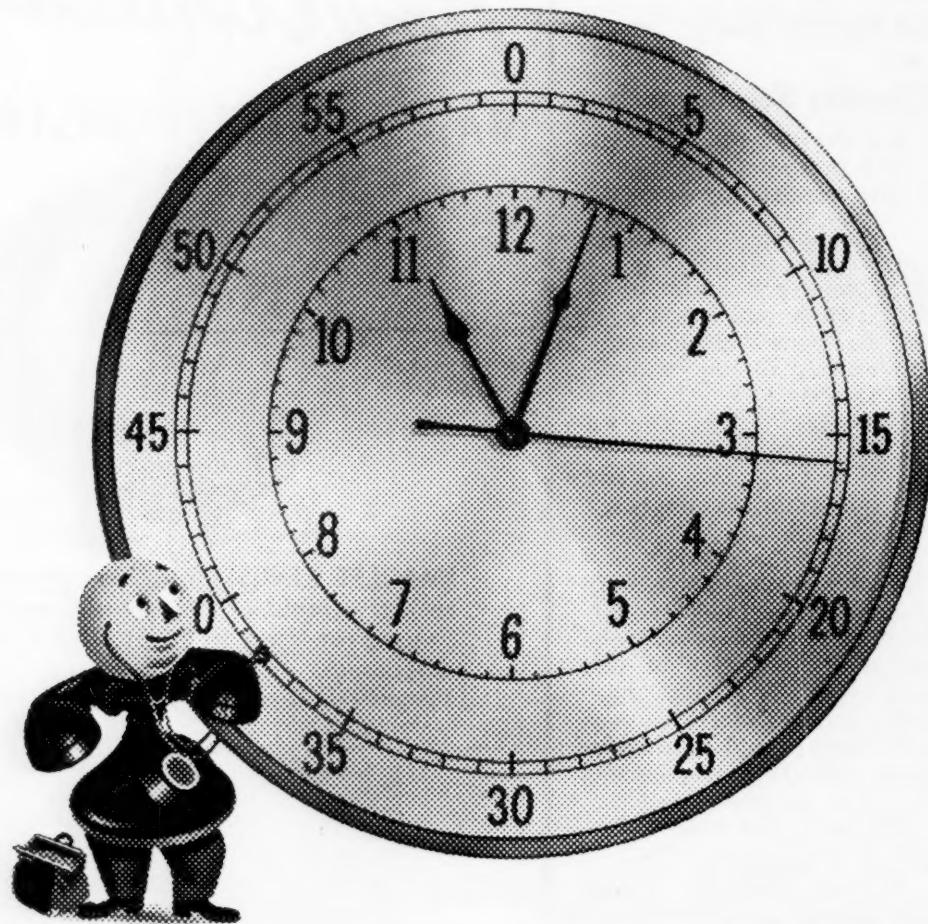


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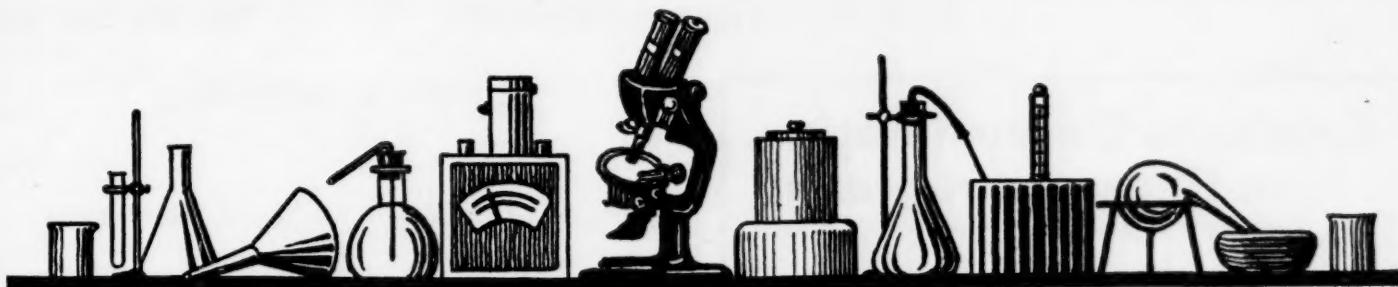
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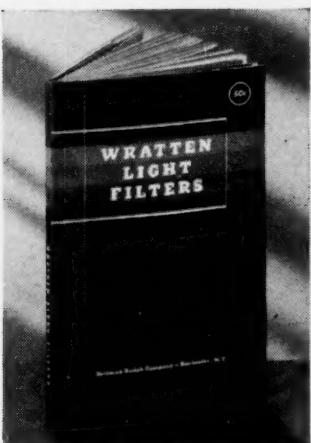
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